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A RECORD OF THE PROGRESS OF PHARMACY AND THE ALLIED SCIENCES

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THE AMERICAN
JOURNAL OF PHARMACY

Vol. 93 May, 1921 No. 5

EDITORIAL

DYESTUFFS AND PHARMACY.

The relation existing between dyestuffs and pharmacy may not be any more apparent to our legislators at Washington than the relation between dyestuffs and explosives, or dyestuffs and chemistry, but it is a real one, nevertheless. Our State and National pharmaceutical organizations, which are planning to hold meetings during the next few months, should take cognizance thereof and pass suitable resolutions insisting upon a proper protection of this key industry upbuilding and maintenance of which is so vital to our peace-time prosperity and our war-time success.

We must not permit a warped and limited vision on the part of a few to bring about a condition that will do injustice to the many.

The processes by which many of our officially recognized and widely used synthetic remedies are manufactured need not be actually carried on in dyestuff plants, but the interdependence in the matter of raw materials and intermediates makes it impossible to succeed in either one of these lines of work without the other as an adjunct.

Acetanilid, antipyrin, arsphenamine, cinchophen, phenacetin, phenol, cresol and many other medicaments and antiseptics, as well as some actual dyestuffs themselves, such as methylene blue, flavine and scarlet red, are dispensed by pharmacists on the prescriptions of physicians for the prevention or cure of disease.

The maintenance of a domestic supply of these drugs, however, is of minor importance, as is also the matter of cost. What is needed is the encouragement of an industry which is helpful to research and to higher scientific education as well as in the produc-

tion of material things. The dyestuffs manufacturing industry needs protection and it needs it promptly if it is to be saved.

It is a matter of record that the only opposition to it is based on selfish motives. It is a matter of regret that the failure of Congress to act decisively and constructively in the matter, as has already been done by the Parliament of England and the Chamber in France to protect their respective countries from unfair and industry destroying competition of German manufacturers, has not been bitterly resented by every pharmacist and chemist in the land. Inertia in this respect is the cause of our present dilemma.

What we need is the kind of action that will bring to our misrepresentatives who are blocking this action, a realization of their responsibilities and to our Senators an appreciation of the fact that they may become metamorphosed into ex-Senators if they continue to obstruct scientific progress and imperil national safety.

In chemistry some reactions proceed slowly until a catalyst is added, when the speed of the reaction is infinitely increased. The catalyst needed in the reversible reaction which is now exhibiting itself in a condition of static equilibrium in our Washington legislative halls, is an active interest in every scientific body in the country. This interest would be manifested in two ways. First, by the passage of suitable resolutions on the part of the organizations themselves, and second, by active protests on the part of individual members of these organizations, voiced to their local representatives and senators in no uncertain language.

We must prevent a recurrence of the conditions from which we suffered during 1915, when prices went skyrocketing and patients suffered, and in some cases doubtless died, for lack of certain medicaments. Pharmacy can and should do its part in this important work and now is the time when help will most count.

C. H. LaWall.

A GREAT PHARMACIST PASSES AWAY.

Henry P. Hynson, the American pharmacist, whose death has been announced in the journals of the profession, leaves behind him an enviable record of usefulness and attainments. His had been a life of devotion dedicated to the advancement of his profession and to the practicalizing of worth-while ideals.

His unusual personality and accomplishments made him a conspicuous figure in any assembly, but never did he indulge in meretricious artifice to attract popular applause, and disingenuous maneuvering was never perceptible in his character. He did all things with sincerity.

Possessed of an endearing personality, brusque, but versed in courtesy, he made and maintained a wide circle of friends who will inevitably miss his happy companionship and his keen humanness. A pioneer in many fields of pharmaceutic endeavor, he was largely responsible for the formulation of many organizations which now hold potent sway in pharmacy. He was the first President of the National Association of Retail Druggists, and while he differed with some of the later policies of that body, he nevertheless maintained a kind and active interest in all of its activities. In the American Pharmaceutical Association meetings he was always an outstanding figure, and did much constructive work in the development of that organization. The Section on Practical Pharmacy and Dispensing was of his conception, and it was with pride and satisfaction that he annually exhorted the incoming chairman of that section to mind well and zealously its destinies.

His particular pride, however, was in his store in Baltimore, where he reared through constant and sincere efforts a business which today is a beacon light of ethical pharmacy that sheds its message of faith and accomplishment to all the profession.

The Journal of the American Medical Association in commenting upon Henry P. Hynson's death and particularly upon the high standards obtaining in his establishment, thus honors his ideals in no uncertain language:

"As already suggested, his constant effort was to emphasize as of primary importance the service which the educated scientific pharmacist was in a position to render to the public, and to decry the commercial ideas which seemed to be strangling the professional instincts of the pharmacists. He opposed commercial drug store exploitation of the public with 'patent medicines' and making pharmacy a mere adjunct to the sale of soda water, light lunches and novelties. Hynson was one of the few prominent pharmacists who were willing to forego financial gain in order to raise the ethical standards of a profession which he honored. He took an earnest interest in all the live pharmaceutical questions of the day, and pure pharmacy sustained a great loss in his death."

The passing away of this great man undoubtedly leaves a void that can be scarcely filled and the sterling example of him amply blazes the trail for those who are eager to follow in the prints of his climbing foot-steps.

I. G.

ORIGINAL PAPERS

PELARGONIUM-OIL.

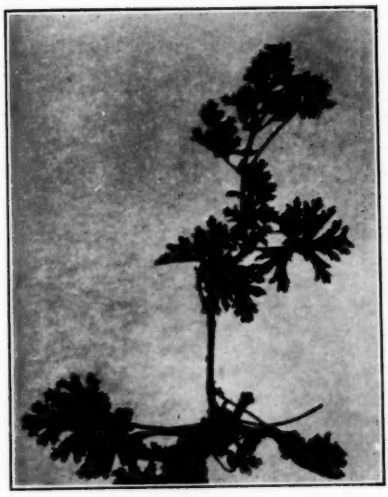
PROFESSOR RICHARD KNUTH,
CHARLOTTENBURG, GERMANY.

The rose-oil which plays a prominent part in the manufacture of the best perfumes and is used pure as perfume and as an ingredient in the manufacture of soap, is produced not only from the petals of Rosa damascena Mill, but often from other plants, which have a similar odor. Such substitutes of the best sort are the pelargonium-, the palmarosa- and the gingergrass-oil. The latter two, according to Stapf (*Kew Bull.*, 1906, p. 297), are respectively termed Andropogon schoenanthus Flück. et Hanb., non L. and Schoenanthus var. Martini Hook f. This plant, which is widely distributed in India, is used, according to his reports, as an oil-plant in Kandesh of the Presidency of Bombay, in the districts of Nagpur, Sagar, Qabalpur, and Karnul, and in Ajmere of Radschputana. According to one opinion, the two oils are produced by different stages of development, according to another by different varieties of the same species.

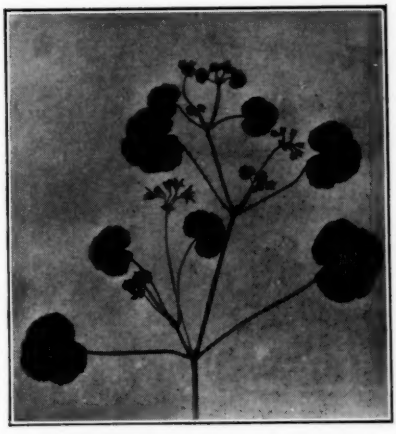
The most valuable substitute for rose-oil is undoubtedly the pelargonium-oil, which is obtained from the rose-geranium. The name of this geranium dates from the time when the two genera geranium and pelargonium had not yet been separated. Linné classed most of the geraniaceæ as geranium; l'Héritier was the first to separate, in 1787-1788, the species pelargonium and erodium from geranium.

CLASSIFICATION OF THE PLANT.

Gintl (p. 268) pointed out in 1879 that the French rose-oil is manufactured from Pelargonium radula, that of Algeria from P. roseum and P. odoratissimum. The French oil is said to polarize light to the right, the Algerian, to the left. According to Heuzé (p.



1. ROSE-GERANIUM



2. PELARGONIUM ODORATISSIMUM (L.) AIT.

3. PELARGONIUM CRAVEOLENS AIT.

4. PELARGONIUM FRAGRANS

305), the species chiefly cultivated in Algeria are P. capitatum, which was introduced into England from the Cape, in 1690, and, to a smaller degree, P. odoratissimum and P. fragans, which also produce a good oil, but whose cultivation is not profitable, owing to the small size of the leaves. Holmes (p. 239) says that several species of the genus are cultivated. According to Cordemoy (p. 170), only P. capitatum is grown on the Isle of Réunion. Likewise Charabot and Gatin (p. 289) report that the plant is generally named P. capitatum, but add that is was determined in the Museum of Paris as P. graveolens Ait. = terebinthaceum Cav. The two authors admit that perhaps several species come into consideration.

As a matter of fact, the classification offers great difficulties. The name P. capitatum is certainly false, because the species is totally different, in the form of its leaves, from the rose-geranium, which is cultivated in Algeria and on the Isle of Réunion. The plant must doubtless be placed in the group of P. graveolens l'Hér. It is true, plants of different localities show differences, which are not insignificant. They may be considered either as varieties of cultivation, or as hybrids of other species, whose origin is now unknown or has been forgotten long since. To understand this, it may be remembered that in the beginning of the nineteenth century there was a sort of fad to hybridize pelargonium species, so that, for instance, the *Geraniaceæ* of Sweet (1820-1830) contain almost 500 of such artificial hybrids, whose origin already at that time had been partly unknown. In the course of time, the origin of each cross became more and more obscure, so that at the present time we are unable to determine the exact origin of a large part of the pelargoniums found in our botanical gardens. This is especially the case in regard to the species which were called lemon-geraniums as early as the time of Sweet, and with which the rose-geranium must be included.

Andrews, in his *Geraniums* (1805), gives under the name of *Geranium capitatum et varietas* a table containing two pelargoniums, one of which is closely related to Pelargonium capitatum and perhaps identical with it. The other variety, however, seems to be related to the rose-geranium. The species represented in his plate bears the name of *rose-scented geranium,* the variety that of *Otto of roses,* a name probably due to the mistake of a gardener. It is not impossible that the latter had been one of the original plants of

our rose-geranium; but I am not sure how great the influence of P. capitatum was in the creation of this variety. In the work quoted, there is found also another pelargonium closely related to the above-mentioned variety and to P. capitatum, and which bears the name of P. oxoniense, because it had first been cultivated in Oxford, England. It is very probable that the parent plant of the rose-geranium was originally purchased under the name of Oxoniense roseum, and that this name came to be misunderstood in the course of time. At any rate, from what has been said it follows clearly that the parent plant was an English product, perhaps from Oxford, that it is related to P. graveolens; perhaps also to P. capitatum, and that it was well known as early as 1805 on account of its rose-odor.

It is, furthermore, of interest that in the above-mentioned book there is a plate representing an hybrid of P. graveolens with P. capitatum, which likewise is related to the rose-geranium, and which has variegated leaves. Andrews classified it as G. capitatum var. and says that the influence of P. quercifolium changed P. capitatum in such a manner as to cause the confusion of P. quercifolium and P. graveolens. It is very interesting that in the work of Sweet neither the name of P. graveolens nor that of rose-geranium can be found.

From all this it can be seen that there exists no botanical name for the plant. In literature the name of P. roseum Willd. is often found. In the herbarium of this author there are two identical plants which bear the names of P. radula var. roseum and of P. graveolens var. roseum, both corresponding to the description of Willdenow in Spec. pl. III (1800), page 679, which is given there under the name of P. radula β roseum. This plant, according to his own words, is a hybrid of P. radula and P. graveolens, an opinion which seems to be justified. But it is hardly identical with the rose-geranium, as I was inclined to believe before this.[1]

It is probable that in France, besides the rose-pelargonium, there is cultivated, though to a smaller extent, P. odoratissimum (L.) Ait. and P. fragans Willd., as indicated by Heuzé (p. 306). Both plants are different from the rose-pelargonium and of a delicate texture. P. odoratissimum belongs to the section of Peristera and was introduced into England, according to Sweet (p. 299), in 1724. P. fra-

[1] I dedicate this interesting plant (*P. Krappeanum* = *P. graveolens* Ait. *hybrid.*) to my friend, Dr. A. H. Krappe, of Indiana University, to whom I am indebted for valuable service in the composition of this paper.

gans is a hybrid of P. odoratissimum and the perennial P. exstipulatum, and in its appearance resembles the former species, but is perennial like the latter. Sweet (p. 172) says that it is an old plant of the English greenhouses. I have never seen these plants in the open or in a herbarium. In Algeria and Réunion the two species are certainly not cultivated.

MORPHOLOGICAL CONSTITUTION OF THE GLANDS.

The oil is furnished by the glands of the plant. These are found, as in all pelargonium species, in the green parts, especially on the surface of the leaves, where they are shorter than on the stem and the peduncles. In most cases they are from $\frac{1}{15}$ to $\frac{1}{18}$ mm. long and can be seen with the naked eye. They consist of from one to three small cylindrical base-cells and a small globular head. The number of the base-cells is smaller in the gland hairs of the leaves than in those of the stems. All gland hairs originate in epidermical cells which multiply by cross-division. The uppermost of the two cells rounds itself and becomes a small head. Whenever the gland hair possesses more than one base-cell, the latter is once more divided into two. The spicate head is, therefore, older than the next lower, and the lowest is the youngest. The oil is mostly found only in the small head, rarely in the neighboring cell. When young, the end-cell is colorless; later it is colored by a yellowish substance and finally becomes brown. This substance often forms a globular body, which, according to Weiss (pp. 577-599), who obtained this result in a related species, lies at the bottom of the cell and is surrounded by a clear liquid. Of the numerous chemical reactions I might mention that of iodine, which colors the young small head bright yellow, the older one dark yellow or almost brown. A solution of potash-lye (KOH) gives a yellow color. Chloride of iron brings about the reaction of tannin.

The researches of Behrens (*Ueber einige aetherisches Oel secernierende Hautdrüsen* in den Ber. d. deutschen Bot. Ges., IV, 1886, p. 400), which this author made in the glands of P. zonale, do not completely agree with those of Weiss. According to the former, the oil originates in the plasm of the cell, so that, upon adding alcohol vacuoles may be seen. In a later state the oil lies in the form of a meniscus between plasma and cell-wall. Finally, there is found between plasma and oil a stratum of cellulose, which changes into a

cuticle. De Bary (*Vergl. Anatomie,* pp. 93-105), had supposed, before the experiments of Behrens, that the oil originates between the cuticle and the other stratum of cellulose, and then enters the plasm; an opinion which, according to Behrens, is wrong.

Concerning the situation of the gland hairs, there exist different opinions, which do not correspond to reality. Charabot and Laloue (Comptes rendus, CXXXVI, 1903, p. 1467) say that only the leaves contain oil, and that in the stems, petioles and flowers, no oil can be found. From this they conclude that the chlorophyll is the origin of the oil.

According to Blandini, of the Agricultural School of Portici (Bertoni in the Bull. de l'Off. du Gouv. de l'Algérie, XII, 1906, p. 277), the flowers produce a larger quantity of oil of excellent quality, an opinion which is certainly not in accordance with the facts.

The oil glands are of great use to the plant, as they protect its vegetable parts from insects and snails. As a matter of fact, all pelargoniums are but little damaged by such enemies. It appears to me to be improbable that the exhalation of aromatic oil plays a part in equalizing the temperature in the neighborhood of the plant, as is often asserted.

GEOGRAPHICAL DISTRIBUTION OF THE ROSE-GERANIUM.

The cultivation of the plant arose in Southern France, spread from there to Algeria, and was then transferred to Réunion and later to Southern Spain. According to R. Gattefossé, insignificant centres of production are found in Corsica (cf. Parfum. moderne, III, 1910, p. 73); according to Heuzé, also in Turkey and Egypt, in which latter country the plant is called *yt'r beledi,* according to the same author.

In France the plant was first cultivated at Grasse, at the foot of the Maritime Alps, near Cannes. Though it was known there as early as 1819, it seems to have been grown only to a limited extent before 1847 (Charabot and Gatin, p. 289). According to the accounts of Grec (Réveil agricole, May 26th, 1901), the cultivation, once of considerable importance, had deteriorated in a regrettable manner. Immigrants transmitted the cultivation of the plant to Algeria, where it sprang up shortly after 1847. The plant was first cultivated in the district of Sahel, Western Algeria, between Oran and Mostaganem, afterwards in the plain of Metidja, near the town of Alger,

and in the litoral of the province of Constantine, near Philippeville and Bougie (Charabot and Gatin, p. 289). Exact accounts regarding the cultivation in the province of Alger are found in Ducellier. The amount of hectares under cultivation is as follows:

Rovigo,	South of Alger in the plain of Metidja	250
Chebli,		210
Boufarik,		200
Bouira, 123 km. to the east of Alger,		160
Mouziaville, west of Blida,		45

Plantations are also found on the hills in the west and southwest of the town of Alger, at a small distance, near Staoueli, Rivet, Bourkika and Chéragra.

To Réunion the cultivation spread not before 1880. The mild climate of the island is well suited to the plant. There it is found in heights of from 400 to 1200 meters, where neither sugar-cane, manioc, nor vanilla (Cordemoy, pp. 170-171) can be grown. The cultivation was favored by the sugar crisis of 1904-1906. Until recent years the lease was such that the owner of the plantation received two-thirds, the farmer one-third of the net profit.

In the Spanish province of Granada, experiments were made regarding the cultivation of the plant about the year 1890. Two firms engaged in the distillation of the oil, producing about 300 kg. (Schimmel, Ber., 1896, p. 33). Although the quality of the oil was in part excellent (Schimmel, Ber., 1894, II, p. 22), the area of cultivation did not increase, owing to the competition of the products of the French colonies, but it is kept up to this day (Charabot and Gatin, p. 289).

Concerning the cultivation of the plant on the Isle of Corsica I have not been able to obtain information.

In the Jewish colonies of Asia Minor, Rischon le Zion and Petach-Tikwah, there are plantations which were founded by Baron Rothschild (cf. Ruppin, *Seifensieder Zeitung,* XLIV, 1917, p. 74, reference in Schimmel, Ber., 1917, I-II, p. 111).

Of the products mentioned the Spanish and the French oil are preferred; they are exported almost exclusively to France, America and Russia (Charabot and Gatin, p. 293). It has been proposed to cultivate the rose-geranium also in other countries; for instance, in Australia and Mexico (*Perfumery and Essential Oil Record,* III, 1912, p. 242). In Limaru, British East Africa, cultivation ex-

periments have been made with a variety of P. radula (*Perfumery and Essential Oil Record,* V, 1914, p. 423); but they have not been continued.

According to a notice of Bertoni (in the *Coltivatore* ex. *Bull. Off. Gouv. gén. de l'Algérie;* cf. Schimmel, Ber., 1907, I, p. 45), the cultivation of pelargonium in Italy is inconsiderable in spite of the rising consumption in the tobacco industry and its importance for the manufacture of perfumes. I must confess that nothing is known to me about the cultivation of pelargonium in Italy or of its use in the manufacture of tobacco.

CULTIVATION.

The plant may attain an age of more than twelve years (Charabot and Gatin, p. 290). In cultivation, all plantations are renewed after from five to six years (Heuzé, p. 307). The plant is indifferent to great heat, but suffers if the temperature sinks to 2° or 3° C., so that a winter temperature of 5° C. may be considered the lowest limit of cultivation. Réunion and Algeria, whose average winter temperature is from 11° to 12° C., are therefore much more favorable to the cultivation of the plant than Southern France, where the plants must be renewed every year or else be protected from the cold. To grow exuberantly, the plant needs a quantity of rain of at least 700 mm., and a locality well exposed to the sun. Good artificial irrigation, as it exists in Réunion, increases the weight of the crop, but not the quantity of oil in tons. In France and Algeria, therefore, this method is not used, especially because the soil is soon exhausted and gets a firm crust, which at length does harm to the plant.

QUALITY AND CULTIVATION OF THE SOIL.

The rose-pelargonium prefers a soil which is well permeable and of silicious or silicious-clayish quality. As the plant is very sensitive to stagnant water, the soil must be perfectly level and deeply plowed, the plant being in need of good ventilation to grow well. By this method also the root-stocks of Cynodon dactylon, the most disagreeable weed of Northern Africa, are removed. After every cutting the rows are hewed through or slightly plowed. The quantity of manure and the manner of its application and distribution is of great importance. Concerning this we have some accounts.

Boutilly on Réunion (p. 179), for the conditions prevailing there, recommends an annual manuring of a ton of superphosphate

per hectare. He tries (see table below) to prove that lime is worthless (cf. columns 5-6 of the table) and chloride of potassium and nitrate of natrium prejudicial (columns 7-9) to the plant. De Villèle (pp. 218-219, 249-251), on the other hand, maintains that lime is an excellent manure for acid soils such as are frequently found in Réunion.

Kind of Manure, (According to Boutilly, p. 178)		Results of an are. 1st ctg. Jan., 1895.	2d ctg. May-June, 1895.	3d ctg. Nov., 1895.	4th ctg. Mar., 1896.	Total.
1. Superphosphate,	200 kg.	1.085	1.335	1.4	.51	4.33
2. Superphosphate,	100 kg.	1.065	1.405	1.3	.525	4.295
Nitrate of sodium,	50 kg.					
Lime,	50 kg.					
3. Superphosphate,	150 kg.	1.18	1.165	.925	.54	3.81
Chloride of potassium,	50 kg.					
4. Superphosphate,	60 kg.	.765	.995	.88	.49	3.13
Chloride of potassium,	50 kg.					
Nitrate of sodium,	20 kg.					
Lime,	70 kg.					
5. Lime,	200 kg.	.690	.99	.8	.485	2.965
6. Without manure,		.795	.635	1.	.31	2.74
7. Chloride of potassium,	200 kg.	.32	.67	.89	.44	2.32
8. Chloride of potassium,	150 kg.	.49	.8	.61	.325	2.225
Nitrate of sodium,	50 kg.					
9. Nitrate of sodium,	200 kg.	.615	.515	.855	.24	2.225

He sees a confirmation of his opinion in analysis. The good effect of superphosphate is due, in his opinion, less to the phosphate itself than to the sulphate of lime, which is mixed with it.

Belle, whose plantations are situated in France at Biot, Dépt. des Alpes Maritimes, recommends 800 kg. of superphosphate, 600 kg. of nitrate of sodium, and 400 kg. of chloride of potassium per hectare (Charabot and Gatin, p. 291).

Lecq and Rivière recommend 300 kg. of sulphate of ammonium, and 150 kg. of sulphate of potassium (Charabot and Gatin, p. 291).

Jolivet uses 300 kg. of superphosphate, 200 kg. of nitrate of sodium or, in place of the latter, 150 kg. of sulphate of ammonium, and 150 kg. of potassium (Charabot and Gatin, p. 291).

PROPAGATION.

The propagation is made by cuttings, as the plant is mostly sterile. I have found, however, wild specimens producing fruits in the outskirts of the town of Alger, near Maison Carrée. For the propagation the third cut is generally used, the autumn drivings,

especially, at a length of from 25 to 30 cm. The expense for one thousand cuttings varies from 0.6 to 2 francs.

A good cutting must have from 4 to 5 lateral buds. The larger part of the leaves must be removed, as otherwise the heat would harm them. The cutting must be done with a knife, not by breaking, for the quick production of a callus, as otherwise mould fungi enter the wound. The preparation of the cutting is, therefore, the same as with our P. zonale. In most cases they are put in boxes in such a manner that there is an interval between the plants of a row, amounting to 1 or 2 cm., and also between the different rows, amounting to 15 or 20 cm. The cuttings, well rooted, are put in the open land from 15 to 20 cm. deep and earthed up slightly. The distance between the individual plants varies. According to Charabot and Gatin (p. 292) there is, in most cases, a distance of from 30 to 35 cm. between the plants of a row, and one of from 70 to 80 cm. between the rows. On a hectare there may be, then, from 35,000 to 50,000 plants. Heuzé (p. 306) proposes from 40 to 50 cm. between the individual plants of a row, and from 65 to 100 cm. between the rows. The same author points out that in the plantations of Simonnet in Hussein Dey and of Chiris in Boufarik, a distance of 90 cm. between the plants and rows is used, so that the hectare contains from 10,000 to 12,000 plants. For the plantations of Mercusin in Chéragas and of Ferraud in Hydra, the distance between the plants and rows is 50 cm., and the total amount of plants is 40,000 per hectare.

DISEASES.

There are very few diseases from which the plant has to suffer. In its youth it is attacked by insects. In a full-grown stage, the oil is a good protection against insects and snails. Cuscuta does not do great harm to the plant. Then the shrubs must be cut away and the stumps sprinkled over with a liquid of 5 per cent. of iron-vitriol. Species of Orobanche may also sponge upon pelargonium. Of other weeds prejudicial to its growth, Cynodon dactylon L. may be mentioned.

HARVEST.

The plants well cultivated may reach the height of a meter, and in Algeria they are cut in the course of the hot season with a sickle, three or two times. The weather must be sunny and dry. At the first harvest, which generally takes place in April, the branches may

be shortened by 50 or 70 cm. In the second cut, which takes place in June, the branches are shortened by only 25 or 30 cm. Under good conditions there is a third cut in November. For only two cuts, the months of May and October are chosen. The branches are gathered in open baskets and vats, to avoid fermentation. The material must be worked up immediately. For distillation the leaves of the young shoots only are used. According to the accounts of Heuzé (p. 307), there may also be used leaves which have been carefully dried by turning. They are said to produce a better oil.

DISTILLATION.

Distillation is done in retorts with double bottom, to avoid irregular heating of the contents. In Algeria and Réunion almost every plantation has its own retort. The substance is distilled with water and produces an oil of yellowish, greenish or brownish color. In the Sahel of Algeria and the Metidja, there were, according to Heuzé (p. 308) about 48 retorts in the year 1893, producing annually 300 kg. of oil. According to Cordemoy (p. 171), there existed in Réunion about 250 retorts, every one of which yielded a tax of 10 francs.

Concerning the output of the harvest there are two accounts. According to Charabot and Gatin (p. 293) from 1000 to 1800 kg. of leaves yield, in Réunion, 1 kg. of oil. One hectare yields, in Réunion, from 30 to 50 kg.; in Algeria, from 20 to 30 kg. Heuzé (p. 307) relates that every individual plant yields 1 kg. of leaves, one hectare, consequently, 40,000 kg. But since 100 kg. of leaves yield only from 7 to 7½ g. of distillate oil, one hectare yields 400 times 7½ g., that is, 30 kg. of oil, a result which nearly agrees with the preceding. Plants of Southern France are said to produce less oil than those of Algeria.

PROCEEDS.

Charabot and Gatin (p. 293) publish two accounts for the year 1901.

Jolivet in Algeria calculates the annual expense per hectare in the following manner:

Cultivation and expenses of distillation,	300 francs
Annual amortization of the expenses,	60 "
Lease,	75 "
	435 "

Schilling in Algeria comes to a similar result:

Lease,	60	francs
45,000 cuttings for 90 francs in 8 years, per year,	11.25	"
Plough,	20	"
Plantation,	30	"
Weed, twice,	40	"
Ploughing, twice,	20	"
Harvest,	120	"
Distillation,	182.50	"
Packing,	13.50	"
	497.25	"

To these expenses corresponds a revenue of 30 kg. of oil, each selling at 35 francs, that is, 1050 francs; the net proceeds per hectare amount, then, to 500 francs.

Grec (Réveil agricole, May 26th, 1901) estimates 40,000 kg. of leaves per hectare; according to him, 100 kg. yield a net proceed of from 5 to 5½ francs, so that a hectare would yield 2000 francs. This estimate seems to have been made for French plantations. There the expenses would naturally be greater than in Algeria.

Exportation Statistics.

ALGERIA.

Year.	*Exportation in kg.*	*Price per kg. in francs.*
1888		64
1889		85
1890		55
1891		50
1892		50
1893		54
1894		53
1895		52
1896		49
1901	37,500	44
1902	35,300	41
1903	31,200	36
1904	53,600	34
1905	52,600	30
1906	54,600	25

Year.	Exportation in kg.	Price per kg. in francs.
1907	38,700	25
1908	46,600	22
1909	41,000	24
1910	33,800	30
1911	28,500	35– 60
1912	24,900	60
1913	38,400	70–100

The exportation of the Algeria oil to Germany, according to Schimmel (Ber., 1903, II, p. 31), in the year 1900 amounted to 1140 kg.; to France, to about 8300 kg., and to Italy to 105 kg.

RÉUNION.

Year.	Exportation in kg.	Price per kg. in francs.
1890		56
1891		44
1892		49
1893		46
1894		45
1895		46
1896		44
1897		38
1898	16,000	32
1899	13,000	30
1900	7,100	30
1901	15,000	40
1902	17,193	36
1903	25,323	29
1904	27,660	27
1905	38,334	24
1906	31,645	22
1907	31,247	21
1908	34,300	20
1909	57,580	20
1910	65,000	34
1911	45,000	
1912	43,000	70
1913	43,614	40
1914	70,000	77
Beginning of the war		25–20

(*To be Continued.*)

THE ANALYTICAL CHARACTERISTICS OF POWDERED TALCUM FOR USE IN TOILET ARTICLES.

By GEORGE E. ÉWE.

Talcum is used for very many commercial purposes such as lubrication, as fillers in rubber and compositions of various kinds, paper, marking pencils, paints, the cleaning of textiles, for clarifying and absorbent processes, etc. The chief pharmaceutical uses are: for toilet talcum, medicinal dusting powders, face powders, foot powders, as a lubricant in tablet manufacture, for coating pills and as a clarifying and absorbent agent.

These many and varied uses call for various grades, and, as a consequence, the market affords many grades. Therefore the establishment of suitable standards for analytical characteristics for the proper selection of powdered talcum for use in toilet articles becomes a specific necessity in order to obtain satisfactory material.

Originally talcum is a rock, and being a natural product, is subject to all the variations in quality inherent in a product taken from the earth. In its natural location it is associated with many different kinds of mineral substances, all of which are harder than itself, talcum being practically the softest of all minerals. Therefore, in selecting talcum for toilet articles it is necessary that care be taken to insure the absence of these associated substances, which are harder, and as a consequence, harsher to the touch.

It is also important to take into consideration other characteristics, such as fineness of subdivision, whiteness, feel between thumb and forefinger, adherence, "pearliness," density, sifting quality, chemical characteristics and freedom from dampness.

Discussion of the importance of each characteristic and of the method of employing the characteristic as a means of selecting powdered talcum will be taken up in the case of each characteristic mentioned above.

Harsh Associated Substances.—The presence of these substances is usually made evident by the "thumb and forefinger" test, which consists of rubbing a pinch of the powdered material between the thumb and forefinger and carefully noting the "feel." The value of this test can only be appreciated after extensive comparative tests.

Fineness of Subdivision.—This characteristic is determined by comparative tests under the microscope. A powdered talcum which is coarser under the microscope will be harsher to the touch and unsatisfactory in the "thumb and forefinger" test. No definite standard of size of particle can be laid down; frequent comparative microscopic observations in conjunction with the "thumb and forefinger" test being required to demonstrate the value of the microscopic method of testing the fineness of subdivision.

Feel Between Thumb and Forefinger.—This is known as the "thumb and forefinger" test. The method of making this test is outlined above under "Harsh Associated Substances." The pharmacist will realize the importance of this test when he recalls that the prospective customer when considering the purchase of a powdered talcum will invariably make this test either between the thumb and forefinger or between the palms of the hands after first ascertaining the odor of the powder. The perfuming of toilet talcums is foreign to the subject of this article but must be considered of even more importance than the analytical characteristics of the powder used in making the product, provided the powder passably conforms to the analytical tests.

Whiteness.—Whiteness, to a certain degree, is measured by fineness of subdivision; the finer the subdivision the whiter the powder. This is only true, however, of talcum from the same natural source. The comparative color of talcums from different sources must be considered a separate problem. Whiteness is best determined comparatively by placing a small mound of the powder under test on a white sheet of paper and comparing its color with that of a similar mound of a satisfactory standard powder on the same sheet of paper. Whiteness of product is a very important matter, as the trade prefers a snowy-white product.

Adherence Test.—A desirable characteristic of toilet talcum consists of its ability to adhere well to the skin when rubbed thereon, because one of the reasons for the use of talcum is its covering power. Aside from this, toilet talcum must adhere well from the standpoint of economy, the more adherent product possessing greater covering power and therefore requiring the use of less material for a given amount of surface. The adherence test can be applied by rubbing the talcum upon the under side of the

forearm or other smooth, non-hairy surface, in comparison with a satisfactory standard product. Considerable experience gained through numerous comparative tests is necessary in order to develop a standard and demonstrate the value of this test.

"Pearliness."—"Pearliness" is one of the desirable qualities of a toilet talcum. It consists of the ability of the product to produce a pearly or wax-like "bloom" on the skin. Powdered talcum produces this effect by breaking up the reflection of the light which approaches total reflection from a shiny skin. This it does by superimposing innumerable minute reflecting surfaces over the single, almost continuous, reflecting surface represented by a "shiny" skin. The test for "pearliness" is made at the same time as the adherence test, and like the adherence test, considerable experience with it is required to demonstrate its value and to develop a standard.

Density.—"Fluffiness," or low density is desired by an average user of toilet talcum. Powdered talcums vary considerably in this respect. These variations are due to differences in chemical and physical characteristics of the rock and the fineness of subdivision, adhering ability and moisture content of the powder. Maximum fluffiness is desirable, therefore, a standard method of testing for density and an arbitrary standard, based upon examination of satisfactory materials, must be established. The method of testing for density which has given excellent results in the laboratory with which I am connected, consists of determining the weight of the powder which is held by a standard size cup when the cup is filled with powder under specified conditions. For this purpose a small, cylindrical, metal crucible is used; metal being preferred to glass or porcelain for the reason that breakage would necessitate the extra trouble of determining a new standard. This metal crucible or cup is used as follows: The cup is weighed, the powder is poured in until it is piled up over the top; the excess is scraped off with a spatula and the crucible, so filled, is weighed again. As an arbitrary standard we have adopted a powdered talcum of which our cup holds 9 grams, having determined that such a talcum will possess a desirable "fluffiness." In making the determination of density care must be taken not to shake or tamp down the powder since the object of the test is to determine the density or fluffiness of the powder in a loose condition such as exists during its practical

use. The powdered talcum offered for use in the manufacture of toilet talcum varies considerably in "fluffiness." A recent examination of five lots from different sources showed densities of 10.4, 9.09, 9.36, 9.0 and 9.72 respectively when tested with the standardized cup described above.

Sifting Quality.—This is important because of the necessity of seiving powdered talcum owing to the presence of particles of extraneous matters and unground talcum in commercial shipments.

Sifting is also necessary in order to disintegrate lumps. The sifting quality is also important from the standpoint of ease with which it can be shaken from the market container of toilet talcum, in which it is finally used. Commercial talcums vary greatly in their sifting qualities, some lots being very difficult to handle because of their tendency to clump up and thus refuse to pass through the seive. Considerable expense and trouble can be eliminated by careful selection of powdered talcum in this respect. The fineness of subdivision, density, adhering ability and moisture content all influence the sifting quality of a powdered talcum.

Freedom from Dampness.—Freedom from dampness is necessary as affecting chiefly the sifting qualities; dampness rendering sifting very slow and tedious. Dampness also affects the color and density, both of these characteristics being deleteriously altered. No exact figure for maximum moisture content can be laid down as satisfactory for all lots of talcums, but in most cases not more than 3 per cent. of moisture should be lost by powdered talcum when dried at 100°C. to constant weight.

Chemical Characteristics.—Talcum is essentially a native hydrous magnesium-aluminum silicate, but may be associated with numerous other substances. The chemical characteristics of talcum and associated substances materially affect the physical tests discussed above but any baleful influences may be avoided by selecting material in strict accordance with these physical tests.

As a matter of fact, it is only by the application of the careful analytical tests mentioned in this communication that a high-grade toilet talcum can be produced.

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THE VOLATILIZATION OF ETHYL NITRITE FROM SWEET SPIRIT OF NITRE.

By J. G. Roberts.

An investigation to determine the cause of the deterioration of sweet spirit of nitre was instituted on account of the frequent prevalence of low strength samples, which had supposedly been stored under normal conditions.

As shown by the following results deterioration is due to either the decomposition of, or, to the volatilization of the ethyl nitrite. Decomposition is due to the action of light and volatilization to the action of heat, to the imperfect sealing of containers or to insufficiently filled containers. Carelessness or slowness in mixing the ethyl nitrite and alcohol is also a contributing factor. The latter cause can however be eliminated, particularly when a small quantity is prepared, by using the sealed tubes which contain sufficient ethyl nitrite, which when mixed with one pint of alcohol will produce sweet spirit of nitre of normal strength.

Ethyl Nitrite or Nitrous Ether, as it was first named, is a well-established product which has been well known for a considerable period. It was discovered by Kunkel as early as 1681, and was obtained by the reaction of nitric acid, alcohol and copper. It is a yellowish volatile liquid of a pleasant, ethereal odor, has a specific gravity of .990 at 15.5° C., and boils at 17° C. It is readily miscible with alcohol, from which it is easily dissipated when not properly stored.

In the present method of manufacture, ethyl nitrite is produced by the reaction of sodium nitrite, sulphuric acid and alcohol. It is preferably made in a stone-ware vessel of convenient size, which is provided with a mechanical stirrer. The resulting gaseous ethyl nitrite is passed through a well-cooled condenser and collected in an ice-packed receiving vessel. As it is decomposed in the presence of water, particular care is taken to render it anhydrous.

Sweet spirit of nitre is a very popular article, and judging from the attention given it, it has the greatest popularity among the various National, State and Municipal authorities who have made it a very frequent cause of investigation and examination. That their vigilance is justified is proven by the large number of cases of low quality sweet spirit of nitre that they have found. The ready vola-

tility of its ethyl nitrite content, has always been a disturbing factor, and is a matter of deep concern to all those who take pride in the quality of the preparations they dispense.

According to modern chemical classification ethyl nitrite is an ester and not an ether. Its ethereal quality was probably the reason for the name or possibly on account of the discarded, inaccurate term "compound ether," that was formerly applied to this class of products. This inaccuracy should be corrected in the next revision of the U. S. P., and the name Spirit of Ethyl Nitrite adopted. It would then be consistent and in uniformity with Spirit of Glyceryl Trinitrate, which has been adopted for spirit of nitroglycerine.

With the object of determining the factor most responsible for the deterioration in quality, a number of experiments were conducted and the following results noted:

EXPERIMENT NO. 1.

One-ounce flint and amber bottles were completely filled and placed in a refrigerator.

	Flint bottle.	*Amber bottle.*
Original strength,	5.25 per cent.	5.25 per cent.
After keeping 4 weeks,	5.22 " "	5.23 " "

Practically no change occurred in contents of either style of bottle when kept for this period under the above condition.

EXPERIMENT NO. 2.

One-ounce flint and amber bottles were completely filled and kept in a dark closet at room temperature for four weeks.

	Flint bottle.	*Amber bottle.*
Original strength,	5.25 per cent.	5.25 per cent.
After keeping 4 weeks,	5.20 " "	5.19 " "

Very little change occurred in contents of either style of bottle.

EXPERIMENT NO. 3.

One-ounce flint and amber bottles were completely filled and kept on shelf for 4 weeks.

	Flint.	*Amber.*
Original strength,	5.25 per cent.	5.25 per cent.
After 1 week,	5.24 " "	5.25 " "
After 2 weeks,	5.24 " "	5.23 " "
After 3 weeks,	5.24 " "	5.22 " "
After 4 weeks,	5.07 " "	5.19 " "

Only a little change occurred in the amber containers and practically none in the flint containers until between the third and fourth weeks, when a perceptible decrease in strength occurred. This peculiarity has been noted at various times and may be due to the presence of a foreign substance.

EXPERIMENT NO. 4.

One pint was placed in a one-pint glass stoppered bottle and examined weekly.

Original strength.	*After 1 week.*	*After 2 weeks.*	*After 3 weeks.*	*After 4 weeks.*
5.25 per cent.	5.1 per cent.	4.99 per cent.	4.96 per cent.	4.86 per cent.

This bottle was kept on a shelf under ordinary conditions. A progressive loss of about .4 per cent. for this period is noted.

EXPERIMENT NO. 5.

A one-quart cork stoppered bottle was filled and placed on shelf. Two ounces were taken out each day and the strength noted. The following results given in the order of their testing, were obtained on succeeding days: 5.22 per cent., 5.22 per cent., 5.22 per cent., 5.18 per cent., 5.16 per cent., 5.1 per cent., 5.07 per cent., 5.11 per cent., 5.01 per cent., 4.95 per cent., 4.90 per cent., 4.7 per cent., 4.57 per cent., 4.62 per cent., 4.04 per cent. As the original strength was 5.25 per cent., it is shown that a loss of 1.21 per cent. was suffered during that period. This test was conducted in order to parallel the conditions that exist when a large number of orders are filled from the same container.

EXPERIMENT NO. 6.

Four ounces were placed in a pint bottle and kept on a shelf under ordinary conditions.

Original strength.	*After keeping 1 day.*	*After keeping 21 days.*
4.58 per cent.	3.92 per cent.	2.71 per cent.

The loss of 1.87 per cent. of ethyl nitrite during this period shows the inadvisability of placing a small quantity in a container that allows a large air space above the liquid.

EXPERIMENT NO. 7.

One-ounce bottles were completely filled, then exposed to direct sunlight, and assayed weekly.

	Flint.	*Amber.*
Original strength,	5.25 per cent.	5.25 per cent.
After 1 week,	4.10 " "	5.24 " "
After 2 weeks,	2.62 " "	5.20 " "
After 3 weeks,	1.89 " "	5.18 " "
After 4 weeks,	1.18 " "	5.19 " "

Results show surprisingly little change in the contents of amber bottles and that the contents of the flint bottles show marked deterioration.

EXPERIMENT NO. 8.

Desiring to determine the relative votality of ethyl nitrite and alcohol when in admixture, 16 ounces were heated on a steam bath. When a quantity equal to the amount of ethyl nitrite present had been driven off it was found to contain 2.5 per cent. ethyl nitrite, which was a loss of 2.08 per cent. Upon continuing the evaporation until all of the ethyl nitrite had been eliminated, it was found that 2.5 ounces had been vaporized, about 1.75 ounces of which was alcohol.

EXPERIMENT NO. 9.

Exposure to the atmosphere in a porcelain evaporating dish.

Original strength.	*After ½ hour.*	*After 1 hour.*	*After 1½ hours.*
4.58 per cent.	1.4 per cent.	.275 per cent.	.038 per cent.

The pronounced volatility of the ethyl nitrite is well illustrated in this test, which shows the elimination of practically all of it in 1½ hours.

EXPERIMENT NO. 10.

Exposure to the atmosphere and agitation in a porcelain dish.

Original strength.	*After stirring 1 minute.*	*After stirring 3 minutes.*	*After stirring 5 minutes.*
4.56 per cent.	3.58 per cent.	2.19 per cent.	1.54 per cent.

After stirring 10 minutes	*After stirring 15 minutes.*
.57 per cent.	.19 per cent.

The rate of elimination was substantially increased by stirring as most of the ethyl nitrite was dissipated in 10 minutes and practically all in 15 minutes.

As a result of this study we find that ethyl nitrite is easily dissipated from an alcoholic solution; that the action of direct sunlight is very destructive to it in flint glass containers; that partly filled containers are objectionable, and that it is bad practice to dispense numerous orders from the same container. The ideal method of storage is in small *completely filled,* amber bottles, kept in a refrigerator or ice-box.

NOTE.—Credit is to be given to Mr. T. R. Singer, for his valuable assistance in securing much of the experimental data herewith recorded.

ANALYTICAL LABORATORY OF SMITH, KLINE & FRENCH COMPANY.

ECHINACEA—A REPLY TO DR. BEAL.

The benefit to the scientific world which accompanies a wide discussion of experimental data can hardly be overestimated. Such debate uncovers many diverse opinions and often develops new and important avenues of thought. It stimulates the deductive faculties and should result in increased logical power. Facts are facts; they stubbornly resist controversion; but conclusions which may be drawn from facts are quite a different matter and too often depend upon the *a priori* considerations and unconscious prejudices of the one who is considering the data in question. This is, of course, a well-recognized danger among scientific workers and one against which every precaution is taken. In spite of safeguard, however, it may happen that the same set of data will indicate quite different underlying truths to two different observers and this is especially to be expected in cases where the data is considered by men of different training or different methods of arriving at experimental results.

The comment of Dr. Beal[1] upon our "Experimental Study of Echinacea Therapy,"[2] opens a discussion of the data which we obtained and the conclusions which we drew from them. Dr. Beal

[1] This JOURNAL, 93, 229 (1921).
[2] *J. Agric. Res.*, 20, 63 (1920).

regrets, as we do, that only an abstract of the paper was published in this JOURNAL. It may be said here that the first idea was to reprint the paper in this JOURNAL and that the abstract was prepared only when it became apparent that space could not be given the longer article. The writers, however, have at their disposal a limited number of reprints of their paper and will be glad to furnish copies to those who apply for them as long as their supply lasts.

Dr. Beal has adopted the statistical method in analyzing our data. There can be little objection to this procedure when applied to data of the physical sciences; the law of averages, the method of least squares, and the theory of probability are of great service in such a connection. But when there is a question of animal experimentation—biological science—the great number of factors which enter into the case renders mathematical treatment uncertain unless there is a very large number of experiments upon which to base conclusions. Of these factors only a few can be evaluated; the larger portion are beyond control. Fortunately, however, it is possible to control within narrow limits the factors which are of importance in most investigations and the only untoward result that is due to the minor uncontrollable factors is some small variability in the behaviors of the animals.

The number of experimental animals which we used was small because, as we stated in the published account, the definiteness of our results did not seem to warrant a further sacrifice of animals and because we obtained no evidence which would sanction a hope that data derived from a larger number of experiments would controvert the conclusions that we arrived at with the data actually obtained. Dr. Beal has, however, indicated other conclusions which he thinks a clinician might fairly draw from our figures. These we purpose to consider in detail.

Tetanus.—Twenty-nine animals were given the toxin. Nineteen were given echinacea preparations, four were given the same strength of alcohol as those animals received which had been given the "Specific Medicine Echinacea," and six control animals were untreated. All of the animals died. Of the controls three died in two days and three were found dead on the morning of the third day. Of the experimental animals four which received each 7 ml. of remedy died in two days; five received 4 ml. of remedy and of

these one died in two days, one in four days and three in three days; five which received 2 ml. of remedy were found dead on the morning of the third day; five which received 1 ml. of remedy died on the third day. Of four animals which received each 1 ml. of 69 per cent. alcohol intramuscularly two died in three days and two in four days. All of the animals were carefully autopsied and none showed anything but the tetanus picture.

Dr. Beal has averaged the survival period of the nineteen animals which received echinacea preparations and has compared this figure with the similar average from the six controls. He finds 0.4 day in favor of the echinacea animals. The average of the animals treated with alcohol is 3.5 days, or 0.85 day better than the figure adduced for the echinacea. If the data is significant at all, and we think that a few hours or even days is hardly of importance in the face of the general fatal termination of all the animals, the only conclusions which an unbiased clinician could validly draw would be that the more echinacea the animal receives the sooner will he die; that alcohol may postpone the fatal issue of tetanus but cannot cure it, and that any apparent postponing of the death after echinacea treatment is due to the alcoholic content of the remedy used rather than to any inherent curative powers of the echinacea itself.

An instance of the variability which is encountered in this sort of work and the very minor importance of it may be found in the admirable paper of Doctors Rosenau and Anderson,[3] "The Standardization of Tetanus Antitoxin" from which the following is taken. Of fifty-eight guinea pigs[4] which were given the same dose of tetanus toxin subcutaneously all died; the first died in two days and twelve hours, the last in seven days and twenty-three hours; statistically:

Died in from	1 to 2	days,	none	
	2 to 3	"	3	or 5.1% of the total
	3 to 4	"	22	37.9%
	4 to 5	"	23	39.6%
	5 to 6	"	7	12.0%
	6 to 7	"	2	3.4%
	7 to 8	"	1	1.7%

[3] Hygienic Laboratory, Bulletin 43, March. 1908.
[4] Table No. 4, pp. 16-17.

Of forty-two guinea pigs[5] which were given the same doses of tetanus toxin and tetanus antitoxin, the first died in two days and twenty hours; the last in six days and nineteen hours.

Botulism.—Five animals were given the culture. Three were treated with echinacea and two were reserved as controls. The controls died in one and three days, the treated animals in one, three and three days. The average, of course, favors the echinacea probably because there were not three controls. It is significant, however, that no control died before a treated animal and no treated animal survived the controls.

Septicemia.—The experimental work here is complicated by the well-recognized resistance of the guinea pig to subcutaneous infection by the hemorrhagic septicemia organism and on this account nonvarying results were not expected. The experiment was only undertaken through the great desire of the authors to test the remedial value of the echinacea against a septicema or what in common parlance would be termed a "blood poisoning." The results demonstrate the expected variations. Of thirteen animals which were given the culture, all became sick, eleven died and two recovered. Of the controls, one survived and two died in three days; of the animals which were treated with echinacea two died during the first day, two on the second day, two on the third day and of the remaining four one recovered, and the others died in five, six and twelve days. Thus, 40 per cent. of the treated animals had died before any of the controls, and 60 per cent. of the treated animals were dead when 66 per cent. of the controls had died. Furthermore, the five animals which are grouped in experiments 1 and 3, and of which four survived the controls (one recovering) had received no echinacea for eleven days before the injection of the virulent culture. What the meaning of the survival in the last case is we do not know, but we are certain that an average of such data is not only meaningless, but is actually misleading.

It is to be observed that 33 per cent. of the controls recovered without treatment, while but 10 per cent. of the treated animals survived; would the clinician argue therefore that it is better not to treat this disease since more cases recover without treatment than with?

[5] Table No. 2, pp. 9-10.

Dr. Beal states, "the average clinician in reviewing the results would be likely to claim that they showed a decided effect of the drug in prolonging the life of the infected animals." We are unable to agree with this statement. In the first place no such effect is demonstrated; in the second the clinician would be apt to attach great importance to the fact that the death of 40 per cent. of the cases was apparently hastened by the administration of the echinacea.

Anthrax.—The only point to note here is that the controls died in four and eight days, the average of which is six. We think that the average figure 6 is not significant.

Rattlesnake Venin.—Of eleven animals, six were treated, three were used as stated controls, and two others which were used in determining the M.L.D. of the venin were treated exactly as the controls and may be considered as such. One treated animal managed to survive after hovering between life and death for several weeks in a miserable condition; all of the others died. It has been stated somewhere that 80 per cent. of people bitten by rattlesnakes recover.

Of the fatal cases which received treatment one died on the first day, three died on the third day, and one died on the fifth day. Of the controls, two died on the second day and three on the third day. We do not think that the data warrants any favorable consideration of echinacea as a remedy in crotalus poisoning.

Tuberculosis.—Of eight animals which were infected with the organism two were kept as controls and the rest were treated. One of the controls died in thirteen days; the other control died on the thirty-third day, when four of the treated animals had succumbed, and was survived by the two remaining treated animals for three and five days. Here again we have compared an average of six results with that of two results, which is hardly admissible. If two analyses of some substance showed 13 per cent. and 33 per cent. of, let us say, iodine, would it be legitimate to state that the substance contains 23 per cent. of iodine? The significant fact of the tuberculosis experiment is that, in spite of the fact that the animals received large amounts of the remedies and were given every favorable opportunity for recovery, every one of them died. Furthermore, if anyone wishes to sustain the contention that the slight survival period of the treated animals over the controls is really germane, he must be pre-

pared to show that this effect was not due to the continued ingestion of small amounts of alcohol which, it is said, is of value in tuberculosis.

Trypanosomiasis.—What has been said in respect to tuberculosis applies equally to the dourine experiments. Two of the controls died before the decease of any of the treated animals, and two other controls survived all but one of the treated animals. The period of sickness was:

Treated animals, 48, 61, 64, 66, 71, 93 days.
Controls, 17, 30 78, 79 days.

In other words, when 83.3 per cent. of the treated animals had died, 50 per cent. of the controls were still living.

We cannot accept the idea that an unbiased clinician would draw other conclusions from these data than those which we have presented. Each of the writers has had considerable experience with clinical medicine; we are familiar with the reasoning of the clinicians and also with the great complexity and uncertainty of the evidence which they obtain. The great difficulty of the clinician is the lack of definite controls; he can seldom demonstrate that the patient would have died had he not received a certain treatment. On the other hand, it not infrequently occurs that a patient recovers when the physician had been certain that he would die. Under such circumstances there should not be any diversity of opinion between the clinician and the "laboratory worker." Each must recognize the limitations of his powers and opportunities and the evidence contributed by each must be given due consideration in determining the truth.[6]

After giving full and careful consideration to the comment of Dr. Beal, the writers wish to state that they see no reason to withdraw any of their stated conclusions, nor do they agree that the data can be construed to indicate anything in favor of the continued use of echinacea in these diseases.

LEIGH T. GILTNER,
JAMES F. COUCH.

[6] In the published abstract the following corrections should be noted:
Page 227—For T. Giltner, read L. T. Giltner.
Page 228—Line 13, for "per se," read "per os."

ECHINACEA.*

In connection with the foregoing communication the following reprinted editorial is of considerable interest:

Intelligent members of the medical profession must be well aware that both the Pharmacopeia of the United States and the National Formulary, now recognized by Federal and State laws as standards for drugs and their preparations, include many products that can scarcely be justified as medicinal on the basis of scientific considerations. When once a preparation has found its way into these "official" lists, it thereby gains the presumption of some therapeutic virtue. All too frequently, what it lacks in this respect is replaced by the potent promises of specious advertising; and when the admitted product thus becomes recognized, its place often is long assured by some indefinable force of tradition and reverence for supposed pharmacopœial wisdom.

Among the products included in the National Formulary is the fluidextract of echinacea. The claims for this drug as an "alterative" and "antisyphilitic" are denoted by one of the publications of the American Medical Association as "extravagant and unwarranted," with the added statement that there are no established indications for its use.[1] In 1909 a report of the Council on Pharmacy and Chemistry of the American Medical Association denied echinacea a place in New and Nonofficial Remedies, with the statement that, in view of the lack of any scientific scrutiny of the claims made for it, echinacea is deemed unworthy of further consideration until more reliable evidence is presented in its favor.[2] Despite this, it is stated by experts of the U. S. Department of Agriculture that the use of echinacea has become extensive. The fluidextract and the tincture are made in enormous quantities, and the root enters into the composition of a large number of patent, proprietary and nonsecret mixtures. Couch and Giltner[3] of the Bureau of Animal Industry, who are responsible for this information, have collected details of the claims variously made for the drug. Echinacea is stated to be a corrective

**Journ. of the Am. Med. Assn.*, 1921, 39.

[1] Epitome of the Pharmacopœia of the United States and the National Formulary, with Comments, Chicago, American Medical Association, 1916, p. 80.

[2] Echinacea Considered Valueless, *J. A. M. A.*, 53; 1836 (Nov. 27), 1909.

[3] Couch, J. F., and Giltner, L. T.: An Experimental Study of Echinacea Therapy, *J. Agric. Res.*, 20: 63 (Oct. 1), 1920.

of "depravation" of body fluids, and of septic, fermentative or zymotic conditions. It is said to antagonize infectious processes and "blood poison," and to be useful in puerperal sepsis, uremia, pernicious malarial or septic fevers, typhoid fever, and all fevers caused by absorption of septic material. It has been advertised as a specific against the venoms of rattlesnakes, other serpents, and insects. "Pyemia" "goiter," "smallpox," "anthrax" and "hydrophobia" are reported to have been cured by echinacea. It is alleged to be an antidote for tetanus. It has been used locally in erysipelas, bedsores, fever sores, chronic ulcers, glandular indurations, syphilitic nodules, burns and gangrene, and is to be an active sialogogue, diuretic and diaphoretic.

This is a rather formidable aggregation of potencies for even the most respectable of drugs. The government pathologists have accordingly undertaken to determine the possible usefulness of echinacea as a remedy in several pathologic conditions induced by bacteria, their products or allied toxins. The results of the experimental investigations on guinea-pigs are devoid of evidence of functional effects, as were the earlier studies of competent workers. In both tetanus and botulism produced by the administration of bacterial toxin, the course of the disease was not modified by the echinacea. In septicemia produced by injection of a culture of Bacillus bovisepticus, and in anthrax produced by infection with B. anthracis, the result indicated that echinacea had no influence. In rattlesnake poisoning produced by injection of a solution of the dry venom, the echinacea preparations were without curative effect. In the chronic diseases, tuberculosis produced by injection of a human strain of the bacillus, and trypanosomiasis produced by injection of Trypanosoma equiperdum, the remedy was administered over an extended period of time without apparently influencing the course of these diseases. Of course, it will be retorted that the negative results on laboratory animals need not necessarily apply to sick human beings, and that subtle potent effects are not always discovered by research workers. An appeal may be made to the "generations" of patients, particularly American Indians, who have experienced the beneficent influences of echinacea. Scientific medicine of today, however, asks for evidence that can be demonstrated by the pharmacologist or can be appreciated and accepted by the critical clinician as well as the quack. Echinacea has not yet established its claims for such recognition although it may remain a name to conjure with.

ABSTRACTED AND REPRINTED ARTICLES

THE ORIGIN, DEVELOPMENT AND VALUE OF THE THALLEIOQUIN REACTION.*

By Wm. Beamont Hart, F. G. C.

An investigation as to the analytical value of the thalleioquin reaction was carried out by the author in the year 1909, but the results as to its quantitative value were of such a negative character that they were not considered to be worthy of publication at the time; in view, however, of later published work, they appear to have some importance.

The earliest published record of the green coloration produced by the addition to a quinine solution of chlorine water followed by ammonia is made by H. A. Muson (*Phil. Mag.*, 1835, 158), who gave its sensibility as 1 in 8750. In Merck's "Reagentzien Verzeichnis" Manson's reaction for morphine and quinine is mentioned, but from the description and references it is quite evident that the name "Manson" is a misprint for "Muson." Brandes and Leber, 1839, gave the name of dalleiochin or thalleioquin to the green product, hence the name of the reaction.

The reaction has been developed in various ways too numerous to detail here, by substitution of bromine for chlorine or by different methods of liberating halogen, to a sensitiveness of 1 : 20,000.

Attempts have been made to use this reaction for the colorimetric determination of quinine, using varying quantities of halogen for quinine molecule: Trimble [2] used 38 atoms of chlorine; Léger [3] used 13 atoms of bromine, and states that the method is useless; Vondraseck,[4] using potassium bromate and hydrochloric acid, assumed

*Reprinted from the *Journ. of the Soc. of Chem. Industry*, 40: 7; April, 1921.

[1] Flückiger, 1872; Vulpius, Vitali, 1886; Hyde, 1897, etc.

[2] Allen, "Comm. Orig. Anal.", 2nd ed.; vol 3, pt. 2, pp. 401-402.

[3] Léger, *J. Pharm. Chim.*, 1904, 281.

[4] Merck, Ann. Rep., 1908, 275.

that with modification and practice it could be used; LaWall used from 10 to 40 atoms of bromine from potassium bromate and hydrobromic acid per mol. of quinine.[5]

From the figures given by Trimble and Léger—the only data found up to 1909—it appeared that the amount of halogen used was excessive and variable. The present author therefore investigated the reaction to determine more minutely (1) the exact conditions necessary; (2) its limit of sensitiveness, and (3) if it were possible to brace a quantitative method on it, using bromine as the halogen.

The following solutions were used: (1) Quinine as sulphate, in dilutions 1:1000 to 1:200,000; (2) bromine water, freshly made, and (3) ammonia, 5 per cent. solution. Preliminary trials showed that the shade of color produced depended (1) on the quantity of bromine; (2) time of action of bromine before addition of ammonia, and (3) deterioration of color by standing after reaction is obtained.

Quantity of Bromine.—In all, eleven dilutions were treated with increasing amounts of bromine, starting with 0.75 and increasing by 0.75 up to 12.75 atoms per mol. of quinine, ammonia being added after similar times of actions, the solutions made up to a total volume of 25 c. c. or 2¼ inches in the tube, and the color shade noted, with the following results:

With quinine solutions 1:1750 or stronger, and with 6 or more atoms of bromine per mol. of quinine, before ammonia addition, a yellow precipitate is obtained.

With increase of bromine and addition of ammonia the color proceeds from blue, blue-green to yellow-green and yellow; finally this yellow disappears, except in solutions 1:5000 or stronger.

The strongest color depth is obtained with 6 atoms of bromine shown consecutively in dilutions 1:1750 to 1:1,200,000; at 1:1000 this maximum appears somewhat earlier with 5.25 atoms of bromine, but the difficulty of comparing colors of precipitates may account for this.

The stronger the quinine solution, the earlier does the yellow shade of green appear; at 1:1000 to 1:10,000 it appears before and extends longer in the series after the maximum color is attained.

Contrary to a published statement that no green precipitate is

[5] LaWall, AMER. J. PHARM., 1904, 281.

obtained in quinine solutions of greater dilution than 1 : 1000, these results show at 1 : 5000, with 6 atoms of bromine, a decided cloudiness; at 1 : 2500, with the same amount of bromine, a precipitate; at 1 : 1750 this precipitation begins at 0.75 atom, is distinct at 2 : 25 atoms, and increases up to the addition of 6 atoms of bromine.

During the addition of ammonia, at dilutions of 1 : 1000 to 1 :5000, a pink coloration is first obtained, which appears earlier with increase of quinine concentration; in every case, when the solution is alkaline, this coloration changes to green on standing.

With increase of bromine, at dilutions of 1 :1000 to 1 : 5000, during addition of ammonia, white fumes appear, which with increase of quinine appear earlier in the series; these fumes were noted with bromine present to the extent of about 0.023 g. per 100 c. c. of solution in excess of the 6 atoms per quinine molecule.

Time of Action of Bromine Before Addition of Ammonia.—Experiments were now made to find the influence of definite intervals of time of action of bromine before addition of ammonia, the intervals chosen being immediate (five seconds), one minute, and five minutes, with the following results: with immediate action, and addition of ammonia till the solution is alkaline, the best results are obtained with stronger solutions down to 1 : 40,000, according to the amount of bromine present; with one-minute action weaker solutions give the best results; action of bromine for five minutes reduces the resultant color strength, but in the weaker solutions (1 : 40,000 downwards) this is still of deeper shade than with the corresponding dilutions with immediate action.

Color—Strength Deterioration.—Trials made for this purpose showed that the green colour fades to some extent, but not very materially, up to five minutes.

The following conclusions are drawn from the above results: (1) Excess of bromine and its prolonged action are detrimental to the production of the thalleioquin reaction, 6 atoms of this halogen for one minute being ample for strongest color depths; (2) with quinine solution 1 : 1000 to 1 : 20,000 the reaction commences in presence of 0.75, at 1 : 40,000 to 1 : 80,000 in presence of 1.5 to 2.25, at 1 : 120,000 in presence of 3, and at 1 : 200,000 in presence of 6

atoms of bromine per mol. of quinine; (3) as a qualitative reaction, by making a few preliminary trials it can be made very sensitive, the limit being 1 : 250,000 in a depth of liquid 2¼ inches (of course, the greater the depth the greater will be its sensibility); for quantitative work, with so many variables, no credence of even approximate accuracy can be assigned to the reaction, except under very strict conditions and in very dilute solutions, as shown.

Bromine Absorption in Aqueous Solution.—Attempts were made to determine the bromine absorption of quinine in aqueous solution for 5, 10, and 20 minutes' action with 2.5, 5 and 11.5 tons of bromine per mol. of quinine, using quinine at 1 : 1000 and bromine water at one-tenth saturation, the excess of bromine being titrated with thiosulphate after addition of potassium iodide. The results obtained showed that although 4 atoms of bromine appears to be the maximum quantity absorbed, and this is constant for five minutes, yet any excess over 2 atoms is only loosely held and appears to be slowly given up again.

The earlier workers (Andre, Brandes, etc.) did not find chlorine in their product; Commanducci,[6] by varying the time of action of chlorine, obtained two new red products even in alkaline solution—a statement at variance with the present author's bromine results. Comstock and Koenigs,[7] by extracting their quinine dibromide with water and separating by means of ammonia, did not obtain any thalleioquin reaction. Buraczewski and Dziurzynski,[8] on treating their quinine pentabromide with water not above 40° C., filtering and adding ammonia to the filtrate, obtained a white flocculent precipitate which soon became emerald-green and contained bromine, and they state that it is probably identical with the substance formed in the thalleioquin reaction. Christensen,[9] by progressive chlorination of quinine, obtained (1) quinine hydroxy chloride and dichloride, in which the vinyl group is saturated and which give the thalleioquin reaction when chlorine followed by ammonia is added to the slightly acid solution; (2) with 4 atoms of chlorine an unstable base, 5-chloro-6-

[6] Ber. Deuts. Pharm. Ges., 1915, 256; 1916, 247.
[7] Commanducci, Chem. Zentr., 1910, 1885.
[8] Ber., 1892, 1539.
[9] Anz. Akad. Wiss. Krakau, 1909, 333.

hydroxycinchonine hydroxychloride, which gives the thalleioquin reaction on treatment with an oxidising agent, a substance that combines with chlorine and ammonia; (3) with 6 atoms of chlorine, an unstable base, 5-dichloro-6-ketocinchonine hydroxychloride, which liberates 2 atoms of iodine from potassium iodide for the 1 active chlorine present, and therefore probably contains the group — $CO.CCl_2$ — in the quinoline nucleus, with consequent conversion into the group — C(OH) :CCl —. This base gives the thalleioquin reaction on addition of ammonia only; the green product on drying leaves a residue if chloro-5.6-diketohydroxycinchonine, the group — $CO.CCl_2$ — being replaced, in presence of ammonia, by the — CO.CO — group.

As far as is known, then, the action of chlorine or bromine on quinine in dilute aqueous acidified solution is similar, and the products, beyond the dihalogen stage, that can be formed during or can give rise to the thalleioquin reaction, are numerous. The author attacked the problem from the analytical standpoint, and his conclusion, in 1909, that 6 atoms of halogen are required for the full reaction, is confirmed by the later results of Christensen; these also explain why, in the results of the bromine absorption in aqueous solution, apparently not more than 4 atoms as a maximum are absorbed, while actually 6 atoms take part in the reaction, the 2 atoms of iodine set free being determined as unabsorbed bromine. It follows, then, that quinine may be determined from its bromine absorption for five minutes in the manner stated: 1 c. c. N/10 Br = 0.0081 g. quinine.

It is possible and probable that the progressive halogen action runs concurrently to some extent; that is to say, part of the halogen is preferably used in further conversion of the intermediate products than in full conversion of quinine into intermediate products; this would explain why the thalleioquin reaction is obtained, though not to the full extent, by the action of much less than 6 atoms of bromine per mol. of quinine. Christensen's statement that the intermediate product, 5-chloro-6-hydroxycinchonine hydroxychloride, gives the reaction by treatment with an oxidising agent, a substance that combines with chlorine, and ammonia, may explain the mechanism of the delay in the final green color production by Vogel's reaction (1850), and also by Battandier's reaction (1904), since we

have the three essentials, time only being necessary; to some extent this also applies to Kletzinsky's reaction (1854), though in this case a further change probably occurs. During the early stage of this investigation the use of a solvent, such as amyl alcohol, for the green product suggested itself, but from the above results it was not thought to be of any value.

DISCUSSION.

The author, replying to a question, said that it was not practicable to estimate the color depths by the absorption spectra or by the colorimeter, owing to the rapid changes of color of the solutions and the large number of experiments being carried out at the same time.

THE QUINOTOXIN MYTH.* †

TORALD SOLLMANN, M. D.

CLEVELAND, OHIO.

Some writers, especially in chemical and pharmaceutical journals, have attributed the toxic effect of quinine to the formation of a more toxic substance, "quinotoxin," or quinicin, as it is more properly called. This may be formed from quinine under suitable conditions, especially in the presence of free organic acids. It has been assumed that these conditions would arise in the stomach, and, also, that prescriptions containing quinine and an organic acid would be dangerously incompatible.

An examination of the data on which these assumptions were based reveals that these fears are not justified by the facts; that at most insignificant traces of quinotoxin could be formed in the body or be present in such prescriptions, and that the formation of considerable quantities would not be dangerous.

The error arose originally from exaggerated conceptions of the toxity of quinotoxin, and was fostered by unproved assumptions as to the amounts that might be formed under practical conditions.

*Reprinted from the *Journ. of the Amer. Med. Assoc.*, April 9, 1921.

†From the Department of Pharmacology, Western Reserve University.

"QUINOTOXIN" A MISNOMER.

The name "quinotoxin" is probably in part responsible for the misconceptions. It is incorrect historically, suggests false theories, and leads to confusion with another, quite different, substance. It should be abandoned, and displaced by the perfectly good name bestowed on it by its original discoverer. Pasteur, in 1853, first prepared this substance and a corresponding derivative of cinchonin, and named them chinicine and chichonicine. The terms chinotoxin and cinchotoxin (and chinatoxins, collectively) were applied forty years later by Miller and Rohde,[1] who prepared these derivatives by a lightly different method. In this, they disregarded not only the fact that these substances had already received a name, but also the fact that the name chinatoxin had been applied eleven years previously by Ostermayer (1884) to an entirely different substance (diquinolin-dimethylsulphate). This is likely to lead to serious confusion. The anglicized terms of Pasteur will, therefore, be used exclusively in the following discussion.

CHEMICAL RELATION OF QUINICIN AND CINCHONICIN TO QUININ AND CINCHONIN.

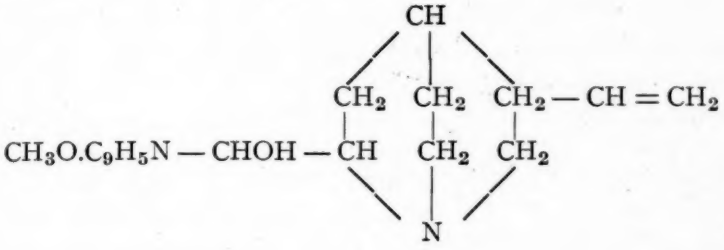
The structure of the cinchona alkaloids is not fully understood, as they have not been synthetized. It is fairly complex. That of quinin may be expressed as $\underset{(a)}{CH_3O.C_9H_5N.}\ \underset{(b)}{CHOH.}\ \underset{(c)}{C_9H_{14}N.}$ $\underset{(d)}{}$

It includes a quinolin ring *(b)*, to which are attached in the para positive a methoxyl (*a*), and a pyridin derivative ("loipon") (*d*), through a CHOH linkage (*c*). Replacement of the methoxyl by other alkyl groups does not destroy the action, but may even fortify it (Fränkel Arzeneimittelsynthese). Omission of the group, however, greatly weakens the antimalarial efficiency, but increases the convulsive action. This is cinchonin, $\underset{(a)}{H.C_9H_5N.}\underset{(b)}{CHOH.}\underset{(c)}{C_9H_{14}N.}\underset{(d)}{}$ Replacement of the CH_3OH by OH gives cuprein.

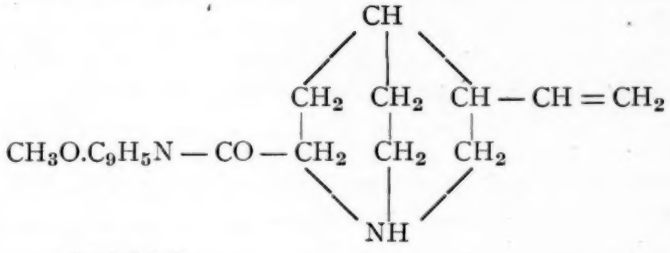
Quinicin and cinchonicin are formed when quinin or cinchonin are heated with acids. They have the same elementary formulas as quinin and cinchonin; but a rearrangement has occurred in the loipon and connecting link (*d*) and (*c*). It is generally believed that the

[1] Miller, W. von, and Rohde: Ber. d. chem. Gesellsch. 28: 1056, 1895.

linking CHOH in *c* is hydrolized to CO, the H being transferred to the adjacent C and N of the loipon, forming an imid group, and breaking the benzene ring, according to this schema:



(quinine) becomes:



(quinicin)

Formation of Quinicin and Cinchonicin by Acids.—Pasteur prepared quinicin by heating quinine with dilute sulphuric acid at 120 C. At 100, however, Biddle [2] found that dilute mineral acids (to normal) convert only from 2 to 3 per cent. of the cinchonine, while weak organic acid (acetic, etc., ten-thousandth normal) transform 95 per cent. The conversion is independent of the dilution or dissociation. Similar results were obtained independently by Rabe.[3]

At from 36 to 38 C. the conversion proceeds very slowly, even with organic acids, so that at most from 0.2 to 1 per cent. are converted in forty-eight hours. The concentration of cinchonicin probably does not increase with longer heating, for there is a parallel transformation of cinchonicin into an insoluble resin.

Some conversion into cinchonicin occurs also in sunlight, and

[2] Biddle, H. C.: J. Am. Chem. Soc. 34: 500, 1912.
[3] Rabe: Ber. d. chem. Gesellsch. 43: 3308, 1910.

more slowly in diffused light; but this also is converted into resin. The formation of cinchonicin or quinicin may be judged by the dark discoloration (Biddle). Quinine behaves in all these respects essentially like cinchonine.

Amount of Quinicin Formed in the Stomach.—Only insignificant traces of quinicin could be formed in the stomach. The hydrolisis of quinine occurs, so far as known, only in acid mediums. This would confine its possible production in the body to the stomach. Kaufmann [4] found that traces of cinchonicin are formed by warming cinchonine with 0.1 per cent. hydrochloric acid. Biddle denies this, but suggests that the transformation would occur when organic acids are present in the stomach, as is not infrequently the case. Both writers overlook the time factor. They found only traces transformed after one or two days, whereas the quinine would remain in the stomach for only a few hours. They also overlook the fact that toxic effects of quinine occur at least as frequently if the quinine is given by channels other than the stomach.

Formation of Quinicin in Prescriptions.—Biddle's work leaves no doubt that this would occur if quinine were subjected to prolonged boiling with organic acid; but there would be no occasion for this in prescribing. It would also be formed at ordinary temperature, but only very slowly; and its parallel conversion into insoluble resin would prevent its accumulation.

There is no doubt that solutions of quinine containing excess of organic acids would very slowly lose their activity, and, for this reason, old, discolored or precipitated solutions should not be dispensed; but there is no reason to apprehend danger from them. Even the changes occurring after a long time in capsules of acetylsaliclic acid and quinin hydrochlorid, as reported by Scoville,[5] are more important by the liberation of salicylic acid than by the formation of quinicin.

Actions of Quinicin.—Hildebrandt [6] asserted that this is not convulsive, that it has a digitoxin effect on the frog heart and that it

[4] Kaufmann, A.: Ber. d. chem. Gesellsch. 46: 1823, 1913.

[5] Scoville, W. L.: J. Am. Pharm. A. 4: 390, 1915; Bull. Pharm. 28: 527, 1915; *ibid.* 29: 174, 1915.

[6] Hildebrandt, H.: Arch. f. exper. Path. u. Pharmakol. 59: 127, 1908.

raises the blood pressure slightly. Biberfeld [7] found this toxicity for mammals quite low (lethal dose, 15 mg. per kilogram by vein; 200 mg. hypodermically, corresponding to about ½ ounce in man). In this large dose, it produced convulsions. It did not have a digitoxin effect on the exposed frog heart, but depressed it like quinin. It also depressed other smooth muscle; it produced local anesthesia similar to quinin, but was not antipyretic.

Actions of Cinchonicin.—The toxity of this is also low. Hildebrandt found the hypodermic lethal dose as 150 mg. per kilogram for mice (equivalent to 10 gm. for a man). The same dose of cinchonin was not toxic. Hunt [8] obtained about the same number for cinchotoxin (310 mg.) as for quinin (370 mg.). Rabbits seem considerably more susceptible. Biberfeld, minimum fatal dose, hypodermically, 10 mg. per kilogram; Fraenkel, fatal dose, hypodermically, 20 mg. per kilogram; Hildebrandt, cat, fatal dose, hypodermically, 20 mg. per kilogram. Death is preceded by violent convulsions.

Hildebrandt described a slight rise of blood pressure. Biberfeld found depression of the circulation. Fraenkel, in the exposed heart, observed first very strong contractions, then diastolic arrest.

CONCLUSIONS.

There is no occasion to fear toxic effects from the transformation of quinin into "quinotoxin" (more properly, quinicin). This substance is not especially toxic, and it could not be formed in significant quantities, if at all, in the body.

It may be formed in prescriptions containing quinine and organic acids; but this would proceed very slowly, and the quinicin would undergo further transformation into inactive products. Such solutions are perfectly proper if used within a few days. They should not be used after prolonged standing, when they become discolored and precipitated; not because they have become toxic, but because they have become inactive.

[7] Biberfeld, J.: Arch. f. exper. Path. u. Pharmakol. 79: 361, 1916.
[8] Hunt, Reid: Arch. internat. de pharmacod. 12: 500, 1903.

PHARMACY AS A LEGITIMATE SCIENCE.*

By Dean Charles H. LaWall,
Philadelphia College of Pharmacy and Science.

Pharmacy as a legitimate and very important science should assume its rightful place in public esteem, according to Prof. Charles H. LaWall, Dean of the Philadelphia College of Pharmacy, which is celebrating its one hundredth anniversary.

The pharmacist must be educated in the basic sciences of botany, chemistry, pharmacognosy, physics and bacteriology, and this pharmaceutical education, begun in America one hundred years ago, has, in the opinion of Prof. LaWall, resulted in the formation of a class of men who deserve the respect and appreciation of the general public.

"The material changes which have taken place in our surroundings since the founding of the Philadelphia College of Apothecaries in 1821," says Prof. LaWall, "have been astounding. Epoch-making discoveries in medicine and chemistry have followed each other in rapid succession. New sciences, such as that of bacteriology, have arisen, and new remedial agencies, such as the serums and vaccines, have appeared, requiring highly specialized knowledge on the part of the dispenser as well as of the physician.

"I think it will be admitted without question that it is just as important to know how to fill a prescription correctly as to know how to write it correctly. Few but a trained pharmacist or a physician know how frequently the dispenser has the issues of life and death in his hands or how much care and skill are required in order to give and dispense medicines which shall be efficacious and safe. The making of even the simplest preparation demands an art and a technique acquired only by study and practice.

"It is necessary for the pharmacist to know the Latin name, the English name and the synonym or popular name of several thousand drugs, chemicals and medicines offhand, and also to know where to immediately turn for information which it would be folly to try to remember concerning these things.

"He must know the physical properties, such as appearance and solubilities of hundreds of chemical salts and to be able to apply distinguishing and identifying tests to substances concerning which there is doubt of their identity. He must know the doses of scores of drugs and medicines of high degree of potency and how to com-

*Reprinted from *The Philadelphia Public Ledger.*

bine substances which are difficult of preparation in presentable and palatable form. He must know when comparatively harmless substances react to produce new products of poisonous possibilities. He must know the misleading popular synonyms and use skillful and adroit methods in ascertaining from a purchaser just what is wanted when no prescription or written order is presented, for drugs having widely dissimilar properties often have the same name among persons of little education.

"In order to perform all these duties properly the pharmacist must be educated in the basic sciences of botany, pharmacognosy, chemistry, physics and bacteriology—pharmacy being a commingling of all these in a virtually applied form. That he may conscientiously fulfill these responsibilities and requirements he must, if he values his professional welfare and progress become a member of the professional associations representative of his calling and keep his scientific knowledge alive by contant reading and study.

"The pharmacist is the responsible authority under the narcotic and revenue laws for the proper handling and dispensing of habit-forming drugs and alcoholic liquors. The proportion of pharmacists who are recreant to this trust is small, indeed, compared to the great number who uphold the law. We hear very quickly about the violators, but nothing is said about the great army of those who are law-abiding. While the pharmacist seems to be fair game for would-be humorists in regard to the liquor question, jokes picturing him as a dope peddler or liquor dealer are as far-fetched and in as bad taste as the hoary jokes about the mother-in-law or sleepy Philadelphia.

"His is the privilege to deal in substances of interest, rarity and value, both intrinsic and potential. His wares are brought to him through the traffic lanes which cover the seven seas. From the spice-laden breezes of Oriental isles; from the base of snow-capped, majestic mountains of great continents; from icebound ports of the polar clime; from tropic jungles; from the land of the midnight sun; from the shadow of the pyramids themselves, come remedies whose history forms one of the most fascinating and romantic chapters of scientific study, for be it known that romance and sciences are often inextricably interwoven. Some of the preparations which he compounds date from the beginning of the Christian era; others had their own origin in some fortuitous discovery of a now forgotten and misled searcher for the philosopher's stone.

" 'Your druggist is more than a merchant' is a slogan frequently seen nowadays. Think it over.

"The pharmacist is entitled to the respect of the community when he serves it faithfully, as is usually the case, and it is time that the same public-spirited support of the city, State and Nation is accorded to the institutions in which pharmacists are trained through-

out the land as is given to medical education and that they should be encouraged and aided in their laudable ambition to raise the educational standards and maintain this important calling at a point where it merits the dignity of a profession, the profession without whose intelligent service the practice of medicine would be hampered and its development retarded.

"Pharmacy is an art and a science. It can never be less; it should be more."

DETERMINATION OF BISMUTH BY FORMALDEHYDE.*

By S. B. TALLANTYRE.

The need for a rapid method of estimating bismuth in medicinal compounds suggested to the author of calling attention to the applicability of the formaldehyde reduction process. The details of the method are as follows:

The compound or preparation is warmed with a small quantity of dilute hydrochloric acid (about 10 per cent.) for a few minutes until it is decomposed and all the bismuth is in solution. The mixture can then usually be treated at once with a fair amount of formaldehyde solution, then a good excess of 10 per cent. sodium hydroxide, warmed and finally boiled until the precipitate of bismuth all separates to the bottom of the solution. The supernatant liquid is now treated with more of the reagents and the whole again heated to boiling to make sure reduction is complete. The clear liquid can then be decanted or filtered off and the bismuth either washed by decantation with hot, weak formaldehyde water, or if it is not in a well-coagulated condition, reboiled with a little more formaldehyde and sodium hydroxide solutions. By stirring or pressing the bismuth collects into a spongy mass which is very easily removed to a tared filter, Gooch crucible, or weighing bottle, washed with absolute alcohol, and weighed after drying an hour or so at 105° C.

The precipitate is pure bismuth produced according to the following reaction:

$$2Bi(OH)_3+3H.CHO+3NaOH=2Bi+3HCO\text{-}ONa+6H_2O.$$

**Chemist and Druggist,* through Merck's Report, April, 1921.

MANUFACTURE OF ESSENTIAL OILS.*

A preliminary statement of the general results of the 1919 census of manufactures, for the Essential Oil industry, has been issued by the Bureau of the Census, Department of Commerce, prepared under the direction of Mr. Eugene F. Hartley, Chief Statistician for Manufactures.

Reports were received from 78 establishments primarily engaged in the manufacture of essential oils (not including the synthetic or artificial oils) during 1919, with products valued at $5,698,403. In addition, essential oils to the value of $27,929 were produced by 7 establishments engaged primarily in other industries. The value of the natural essential oils for all establishments was $4,439,704, and witch-hazel extract $448,938. At the census of 1914 there were 107 establishments (inclusive of 2 primarily in other industries), with products valued at $2,506,361, including essential oils $1,289,482; witch-hazel extract, $575,938.

In 1919, 29 establishments were located in Michigan, 22 in Indiana, 9 in Connecticut, 5 in New York, 4 in New Jersey, 3 in Pennsylvania, 2 in Virginia, and 1 each in California, Kentucky, Ohio and Tennessee.

The statistics for 1919 and 1914 are summarized in the following statement. These figures are preliminary and subject to such change and correction as may be necessary from a further examination of the original reports.

Comparative Summary of Statistics for the Essential Oil Industry, 1919 and 1914.

	Number of Establishments.		Production.	
	1919.	1914.	1919.	1914.
Value of Products.....	[1]78	[2]107	$5,698,403	$2,565,361
Essential Oils, Value	77	103	$4,411,775	$1,289,361
Witch-hazel Extract	3	11		
Gallons			125,412	917,690
Value			$448,938	$575,938
All Other Products, Value ..			$837,690	$699,941

*From a report of the Department of Commerce, Bureau of the Census, Washington.

[1] In addition seven establishments engaged primarily in other industries made essential oils to the value of $27,929.

[2] Includes two establishments which were engaged primarily in other industries.

RHUS DERMATITIS.*

Although the toxicology of poison ivy (*Rhus toxicodendron*) is fairly well understood, the toxic features of the related poison oak (*Rhus diversiloba*) have not been studied to comparable extent. For the harmfulness of the poison ivy, Pfaff [1] placed the responsibility on a substance isolated from the plant and named toxicodendrol. The latter is insoluble in water, but readily dissolves in the organic solvents like ether and alcohol. The product is so active that 0.005 mg. applied to the skin may suffice to provoke local symptoms with pain. A considerable latent period prior to the appearance of the cutaneous alterations has often been described. Recently McNair[2] has come to the conclusion that a polyhydrophenol, to which the name lobinol has been given, is responsible for the irritation of the skin caused by poison oak. The active substance is neither bacterial nor volatile. Poisoning occurs from actual contact with the resinous sap of the plant; but, as McNair points out, it may result through an intermediary agent, which carries the sap, such as particles of soot in smoke, clothing, cordwood, croquet balls and shoes. As in the case of all rhus dermatitis, the most common avenues of invasion of the poison are connected with the cutaneous surfaces, though the respiratory and alimetary tracts may also play a part at times in promoting intoxication with poison oak. The problem of latency has not been solved. With respect to the mechanism by which the dermatitis is spread so that it appears successively on different areas of the body, McNair has ventured several hypotheses. Thus, it may be due to (1) the direct transference of the poison itself by the fingernails or hands from one part of the body to another, or to new areas from the clothes or hair; (2) reflex irritation; (3) contiguity of tissue, and (4) varying durations of latency for the different skin surfaces on the body (varying with the respective thicknesses of their stratum corneum, chemical and physical differences in the skin, etc.). Perhaps further study will show an essential identity in the etiology of all forms of rhus dermatitis.

* *Journ. Amer. Med. Assoc.*, 76: 18 (April), 1921.

[1] Pfaff, F.: J. Exper. Med. 2: 181, 1897.

[2] McNair, J. B.: Pathology of Rhus Dermatitis, Arch Dermat. & Syph. 3: 383 (April), 1921; J. Am. Chem. Soc. 43: 159 (Jan.), 1921; J. Infect Dis. 19: 419 (Sept.), 1916.

ARSENIC FOUND IN PICKLES IS TRACED TO SECOND-HAND CONTAINERS.*

As a result of two investigations recently made by the New York City Department of Health which revealed the presence of arsenic in a barrel of pickles and one of vinegar, a warning has been issued that all food dealers storing human foodstuffs in second-hand containers or vehicles which have been used for the transportation, storage or sale of poison, poisonous compounds or materials deleterious to human health, will be prosecuted to the full extent of the law. It was convincingly established that the arsenic did not originate in the foods in question, but these foods were permeated with it through the use of second-hand containers which had previously been employed for the storage of arsenic. An account of the cases, as described in the official Food and Drug Bulletin of the Department of Health, is given below:

"Recently, a complaint was received by the Bureau of Foods and Drugs indicating that several members of a family residing in the borough of Manhattan were suffering from food poisoning. An inspector of the Bureau was immediately detailed to make a thorough investigation.

"The inspector visited the home of the parents, and found that a mother and four children were suffering from the ingestion of dill pickles. Some of the pickles, which were still obtainable, were procured for the purpose of chemical analysis. It was learned that the pickles had been purchased from a pickle manufacturer doing business in this city.

"A thorough inspection was made of the factory in question, and a comparison made of the pickles found therein with those secured at the home of the persons made ill. A representative sample of the brine solution, and pickles contained therein was taken and submitted to the Chemical Laboratory of the Department of Health for analysis. By this analysis it was found that the brine and pickles contained large amounts of arsenic.

"Upon reviewing the developments of this investigation it was felt that the arsenic may have entered the pickles from the brine, which in turn had absorbed it from the barrel. The pickles were therefore transferred from the suspected container and the barrel removed to the Chemical Laboratory of the Department of Health, where it was scraped and the incrustations adhering thereto analyzed. The report of this analysis showed arsenic in large quantities. Fol-

*From the *Spice Mill*, April, 1921.

lowing up on this investigation, the inspector of the Bureau of Food and Drugs learned that the barrel in question had been purchased from a second-hand barrel dealer in the borough of Brooklyn. Upon interviewing this dealer, information was obtained that the barrel in question had been purchased from a chemical company in Hoboken, New Jersey. An inspection was made of the chemical factory and it was found that the barrel in question had been used to transport crude arsenic from Mexico.

"In completing this investigation a condemnation of four hundred pounds of pickles was made at the pickle factory, and facts recommending prosecution of the pickle manufacturer were recommended for violation of Section 163 of the Sanitary Code, which states that 'No meat, vegetables, or milk not being then healthy, fresh, sound, wholesome, or *safe for human food,* or meat of any animal that has died of disease or accident, shall be brought into the City of New York or held, kept or offered for sale, or sold as such food, or kept or stored, anywhere in said city. . . .' For the purpose of this section, any meat, vegetable, or milk in possession of, or held, kept, or offered for sale by a dealer in food shall, *prima facie,* be deemed to be held, kept and offered for sale as human food.

"During an investigation of food adulterations, an Inspector of the Bureau of Food and Drugs secured a sample of vinegar from a grocery store in the Bronx. Upon analysis it was found that the vinegar in question contained large quantities of arsenic. Upon investigation it was learned that the groceryman had transferred the vinegar from its original container to a second-hand barrel, purchased from a merchant in Brooklyn, who obtained it from a chemical house. The efficient work of the inspectors prevented the sale of this poisonous vinegar from reaching the consuming public."

CULTIVATION AND DISTILLATION OF PEPPERMINT IN PIEDMONT.*

By Consul Dana C. Sycks, Turin, Italy.

A small but very profitable industry in Piedmont is the cultivation and distillation of peppermint. The communes which principally yield this crop are Vigone, Pancalieri, Villafranca Piemonte, Polonghera, Lombnasco, Casalgrasso, and Moretta. The crop for 1920 from this district was 100,000 quintals, or 22,000,000 pounds, obtained from 600 hectares or 1483 acres. The crop of 22,000,000

**Commerce Reports,* April, 1921.

pounds after distillation produced 27,000 kilos or 59,525 pounds of peppermint essence valued at 6,000,000 lire.

The demand for Piedmont peppermint greatly exceeds the production, and the local distillers are endeavoring to increase the annual supply by promising higher prices to the cultivators. For the 1920 crop, the distillers paid 30 lire per quintal (220 pounds) for peppermint leaves.

It is stated that the crop for 1921 will be approximately 20 per cent. larger than the 1920 crop, owing to the increased prices offered.

REPORT OF THE ONE-HUNDREDTH ANNUAL MEETING AND THE ADJOURNED MEETING OF THE PHILADELPHIA COLLEGE OF PHARMACY AND SCIENCE.

The One-Hundredth Annual Meeting of the Philadelphia College of Pharmacy and Science was held in the College Museum on March 28, 1921, at 3:30 P. M., Mr. Howard B. French presiding. There were about 110 members present.

President French read his annual address. The address gave in detail the condition of the property, the number of students in the various classes, the work of the faculty in all the branches of studies, and other matters of vital interest in connection with the management of the building.

The following abstracts from this interesting address call specific attention to certain features of the Centenary Campaign:

"Your President notes with great pleasure the activities of Prof. E. Fullerton Cook, Executive Secretary of your Centennial Committee, and commends the active, earnest and untiring labor which he is giving to the position and also desires to express appreciation of the able assistance which he has received from your office force and from the members of the faculty, as well as for the active co-operation of the Alumni and College membership.

"The sub-committees of your Centennial Committee have been doing remarkable work and deserve all praise and commendation for their activities.

"On February 23rd, in celebration of Founders' Day (February 23, 1821), a large number of people gathered at the College and, although there had been a rather severe snowstorm a few days previous and the streets were not in the best condition, they proceeded to Carpenter's Hall, where a meeting was held at 2:30 o'clock, at

which a large number of descendants of the original incorporators were present. Your President presided, and the minutes of the first three meetings of the College, held in the historical building in February, 1821, were read by your Secretary, Dr. Charles A. Weidemann, after which Mr. George M. Beringer, Chairman of your Board of Trustees, gave a historical address. When the meeting adjourned a motion picture of those leaving the hall was taken by the Stanley News Service, and it is interesting to note that this film has been exhibited in over 200 theatres in Pennsylvania, and also was used by a national service throughout the United States. The College has ordered a copy of the film and will show it during the June celebrations, and will file it in the fire-proof as a historical record.

"At eight o'clock on the evening of February 23rd, a large meeting was held in the Auditorium of your College, at which your President again presided. The meeting was addressed by the Hon. J. Hampton Moore, Mayor of the City of Philadelphia. An interesting address was made by Dean LaWall regarding the 'Founding of the Philadelphia College of Pharmacy and Science.' Prof. H. V. Arny, of the New York College of Pharmacy, delivered an address on 'Pharmacy 100 Years Ago and Today.' Emeritus Professor Samuel T. Sadtler, gave an address on 'The Part That Pharmacists Have Played in the Development of Chemistry.'

"The meeting was full of enthusiasm and adjourned at 11 P. M.

"During the early part of June your Centennial will be celebrated, and from the present until that time the most active cooperation of all interested parties must be given to your Centennial Committee. Much has to be done. Great things have to be accomplished and your executive looks forward to a successful issue as the result of your efforts. He predicts that your College, starting as it does upon the second century of its existence, will have a great and brilliant future, and his hope is that those who will follow will be as actively and zealously interested in the institution and will as loyally support its efforts as those who have been connected with it in the past. To him it has a great future, not only as an educational institution, but as a leader in the science of pharmacy and allied branches. and also in keeping Philadelphia in the forefront as the medical center of this country and even of the world.

"Your President wishes to state that Miss Mary A. Dobbins, as a memorial to her brother, Edwin T. Dobbins, a graduate of your College and a former member of your Board of Trustees, has contributed $20,000 for the establishment of a library fund, the income from which is to be used for the support of and additions to your library."

The Committee on Nominations then presented its usual report. On motion this report was ordered to be received, entered and filed,

when a motion from the floor necessitated, after due formalities, the reopening of the nominations. Dr. Richard V. Mattison withdrew his name as a candidate for First Vice-President, Dr. Charles A. Weidemann for Secretary, and Mr. G. M. Beringer for Editor of the AMERICAN JOURNAL OF PHARMACY. (Notwithstanding Editor Beringer's withdrawal he was unanimously elected, but later insisted on resigning because of reasons stated in his editorial report.) Additional names were placed before the meeting for a number of the offices, and the election proceeded.

The result of the election is as follows:

President, Otto W. Osterlund.
First Vice-President, F. R. Rohrman.
Second Vice-President, Joseph L. Lemberger.
Treasurer, Aubrey H. Weightman.
Corresponding Secretary, Adolph W. Miller, M.D.
Recording Secretary, Ambrose Hunsberger.
Curator, Heber W. Youngken.
Librarian, Freeman P. Stroup.
Editor, AMERICAN JOURNAL OF PHARMACY, George M. Beringer.

Publication Committee.

Prof. J. W. Sturmer, Joseph W. England,
John K. Thum, Prof. Charles H. LaWall,
Prof. E. Fullerton Cook, George M. Beringer,
Robert P. Fischelis.

Committee on Pharmaceutical Meetings.

Clement B. Lowe, M. D., Charles H. LaWall,
George M. Beringer, John K. Thum,
Heber W. Youngken.

Board of Trustees:

J. M. Baer, Ph. G., B. T. Fairchild, Ph. M.,
R. T. Blackwood, Ph. G., H. N. Fraser, M. D., Ph. M.,
Milton Campbell, Ph. G., Ambrose Hunsberger, Ph. G.,
Theodore Campbell, Ph.G., Paul A. Kind,
Wm. L. Cliffe, Ph. M., Otto Kraus, Ph. G.,
Jos. W. England, Ph. M., R. H. Lackey, Ph. G.,

J. L. Lemberger, Ph. M.,
Samuel P. Sadtler, Ph. D.,
LL. D., Chairman,
A. W. Miller, Ph. G., M. D.,
H. K. Mulford, Ph. G.,
O. W. Osterlund, Ph. D.,
J. C. Peacock, Ph. G.,
W. H. Poley, Ph. G.,
W. D. Robinson, Ph. G., M. D.,
F. R. Rohrman, Ph. G.,
S. P. Sadtler, Ph. D., LL. D,.
R. S. Sherwin, Ph. G.,
R. M. Shoemaker, Ph. G.,
F. P. Streeper, Ph. G.,
S. P. Wetherill,
Jos. W. England, Ph. M.,
Vice-Chairman.

After the tellers had concluded their report, Dr. Robinson moved that a committee be appointed to escort the newly elected President to the platform. President French appointed Dr. Robinson to this duty, and then congratulated Mr. Osterlund upon his election and expressed his good wishes for a successful administration.

Mr. Peacock moved that a vote of thanks be tendered Mr. French for the impartial manner in which he had presided. This motion was carried.

Mr. Osterlund then replied to Mr. French's congratulations.

President Osterlund then took the chair.

Mr. Peacock moved that the thanks of the College be tendered to Mr. French, Dr. Mattison and Dr. Weidemann for their valued services over a long period of time. The motion was adopted by a rising vote.

Dr. Robinson then moved (and was seconded) that a committee of five be appointed to draft resolutions expressive of the valuable services rendered the College by Messrs. French, Mattison and Weidemann.

The meeting then adjourned with announcement of a resumed meeting which took place on April 4, 1921, at 3:00 P. M.

The adjourned meeting was called to order by President Osterlund. Minutes of the previous meeting were read by Secretary Hunsberger. Prof. LaWall read a report for the Publication Committee, and the annual report of the Editor. The first report conveyed the sincere regrets of the members in regard to the resignation of Editor George M. Beringer, whose conduct of the policies of the JOURNAL left nothing to be desired. It recommended that the College appropriate the usual amount for the use of the AMERICAN JOURNAL OF PHARMACY for the ensuing year, and also that Mr. Ivor Griffith be selected as the new Editor of the JOURNAL.

Prof. Stroup moved that this report be received and that the recommendations be adopted. The motion was seconded and carried.

The retiring Editor, Mr. George M. Beringer, reported that the JOURNAL had progressed in many ways. The following is a brief statement of the progress of the JOURNAL since 1917:

Increase in mailing list .....165 per cent.
Increase in total revenue .....188 " "
Increase in publication expense .....112 " "

The report further stated that Volume No. 92 of the JOURNAL had been completed and that it contains 946 pages of reading matter, the index requiring sixteen additional pages. The wide range of topics that have been considered in the twelve monthly issues of the JOURNAL is well reflected in the scope of the index. Sixty-three original papers prepared by forty-six authors were published in this volume, and the support that the JOURNAL has received through these contributions from eminent pharmacists and scientists is very gratifying.

The conclusion of the report expresses Mr. Beringer's desire to be relieved of the editorship because of the extent of his burdens and the demands of his personal business, which has made it unusually difficult for him to dedicate to the JOURNAL the time required to carry on the editorial work along the lines designed to hold up the JOURNAL as a potent factor in the pharmaceutical field.

Mr. Peacock moved that the Editor's report be received and filed and that certain recommendations be referred to the Committee on Publication with power to act, and that the other recommendations therein be considered as new business.

Mr. Fischelis moved that a special vote of thanks be extended to Mr. Beringer for the great services he has rendered the College as Editor. Mr. Cliffe seconded this motion, and it was further decided that a resolution of thanks be prepared and entered upon the minutes.

A favorable report of progress was given by the Curator, Prof. Youngken, noting particularly that a number of medicinal plants already mounted had been presented to the Museum. These had been properly filed in the Herbarium. Specific mention is made of interesting specimens by Prof. LaWall, Mr. Beringer and Prof.

Moerk. Dr. John Small has presented to the College an old-fashioned bronze mortar.

It was moved and seconded that this report be received.

Mr. Jos. W. England, Chairman of the Committee on By-laws, presented a recommendation for revision of the by-laws, which would make all persons engaged in applied science eligible for membership.

The President, Mr. Osterlund, appointed the following committee to consider certain changes in the by-laws regarding active and associate membership in the College:

Joseph W. England, Chairman;
Dr. C. A. Weidemann,
Warren H. Poley,
Josiah C. Peacock,
Edward T. Hahn.

With deep regrets it was moved that Mr. Beringer's declination as Editor of the AMERICAN JOURNAL OF PHARMACY be accepted.

Prof. LaWall specifically moved that Mr. Ivor Griffith be nominated Editor. Mr. Peacock seconded the motion. The Secretary cast the ballot for Mr. Griffith, and he was unanimously elected.

The Committee on Necrology reported the death of eleven active members and two associate members during the year 1920.

Prof. Freeman P. Stroup, Librarian, verbally reported that the library had been used extensively during the past year.

Prof. Cook read the report of the Committee on Centennial Celebration.

President Osterlund explained that Prof. Cook was working night and day with other members of the faculty and College in order to make the campaign a success.

The President appointed the following Committee on Resolutions to retiring officers:

Joseph W. England, Chairman;
William Duffield Robinson,
Robert P. Fischelis,
Josiah C. Peacock,
Charles H. LaWall.

The meeting was adjourned to meet the call of the chair.

SCIENTIFIC AND TECHNICAL ABSTRACTS

COLOR TEST FOR OXALIC ACID.—A few crystals of resorcinol are added to about 5 mils (Cc.) of the unknown solution in a test-tube, and the mixture is warmed slightly to dissolve the resorcinol. It is then cooled and 5 mils (Cc.) of concentrated sulphuric acid are carefully and slowly poured in along the side of the tube so as to form a layer. A blue ring will be formed at the junction of the two layers, if oxalic acid is present. The color is best seen if held to the light in front of a sheet of white paper. Care must be taken that the mixture does not warm up appreciably. If the blue color does not appear in a few minutes, the mixture is shaken thoroughly, and after cooling somewhat 5 mils (Cc.) more of sulphuric acid are added. Should the color still fail to appear, the mixed contents of the tube should be gently warmed over a flame (not boiled) when an indigo blue color will diffuse throughout the liquid. If the mixture be cooled with ice-water, the color will disappear only to reappear again on heating. If the mixture be boiled a few minutes, the color will turn a deep dark *green,* which will become a light yellow-green on cooling. If to the cold yellow-green solution an equal volume of sulphuric acid be added so as to form two layers, the *blue* color will again appear. It is believed that all these reactions taken together are characteristic of oxalic acid alone.

This test may be made sensitive to one milligramme if the dry unknown substance be warmed with two drops of a 10 per cent. aqueous resorcinol solution and the sulphuric acid added drop by drop. The blue color then appears immediately. For very dilute solutions of oxalic acid or its salts, it is best to evaporate to a concentration of about 10 per cent.

If interfering substances are present the oxalic acid may be precipitated in ammoniacal solution as the calcium salt, washed with water, and the test applied directly to an aqueous suspension of the salt.—(*Journal of the American Chemical Society,* through *Merck's Report,* April, 1921.)

CLOVE OIL FROM CLOVE STEMS.—The first number of a new journal *The Journal of Indian Industries and Labour,* which is published in Calcutta, contains an article by S. T. Gadre, industrial chemist to the Government of the United Provinces, Cawnpore, giving the results of study of the yield of oil from clove stems, that is, the portions of the branches just adjoining the clove proper. Some interesting data concerning clove production are also included. The principal source of the spice is from forests in the islands of Zanzibar and Pemba, in which a total of nearly five million trees are found, covering over 50,000 acres. Some of the trees are ninety years old. The production 1918-1919, a banner year, was about 29,000,000 pounds. The stems contain a brown substance, which is used as dye by the natives, but the bulk of the stem material was formerly exported to Germany, where it was distilled, and the oil brought into the markets in which the oil from the clove itself was sold. The exhausted stems were much used as an adulterant for cloves. Gadre obtained a large consignment of the stems and subjected them to distillation. He found that the oil corroded a copper still, and had to use a tinned one. He found a yield of about 4.5 per cent. The oil is pale yellow, deepening by exposure to light and air, and turning brown when heated in the water bath. It has an irritating action on mucous membranes. It conforms to all the requirements of the B. P. and U. S. P. The total eugenol by Umney's test was 93.09 per cent. The free eugenol by the method of Varley and Bolsing—said to give results within 0.5 per cent.—was 69.86 per cent.

Clove oil has several important uses. Its value as a source of synthetic vanillin is well known. It was found to have a germicidal value in treating some diseases of camels during the war. The price advanced greatly during that time, but has now fallen somewhat. Gadre thinks that the distillation of the stems can be made a profitable enterprise—H. L.

PROTEIN IN FOOD AS A CAUSE OF HEADACHE.—The proteins of food are capable of producing headache in individuals whose protein mechanism is inadequate for those particular proteins. The articles which are found most often to occasion disturbances, headache, and other manifestations are, in the order of their importance, meat extractives, fruit and fruit extractives, eggs, meat, coffee, tea, choco-

late, cocoa, and certain vegetables, such as tomatoes, mushrooms, rhubarb, and cucumber. Any protein may be the cause. In one case, the protein of oats, and also of potato, caused headache. The protein extracts such as meat soups and fruit juices are even more potent than meat or fruit. This shows that the harmful protein is soluble. The author considers that the usual American hospital diet of meat, soup, eggs, and fruit juice is bad, not only for cases of protein poisoning, but also for infectious diseases, since it has a tendency to reduce the normal alkali reserve which is needed to combat infection. Migraine and periodic headache are primarily due to inherited deficient metabolism, and can, in every instance, be cured by a properly restricted diet.—Dr. R. C. Brown, *Wisconsin Med. J.*, 1920, 19, 337; *J. Amer. Med. Assoc.*, 1921, 76, 338.

Improved Infusion of Digitalis.—The following *modus operandi* gives an infusion which represents the full therapeutic activitiy of the drug, such as is not attained by the method official in the U. S. P. ix. One part of digitalis leaf, in No. 60 powder, is treated with 100 parts of boiling water, and kept for one hour on a boiling water bath, with frequent stirring. It is then filtered, and may be kept in completely filled corked bottles sealed with hard paraffin. Specimens thus prepared and stored in February, 1918, have retained their therapeutic activity unimpaired to date, as shown by the cat test. Since the official U. S. P. infusion does not represent the drug, the standardization of the leaf does not ensure the uniform activity of the official infusion. The infusion prepared by the method described above has not that defect. It is fully active. The dose is exactly ten times that of the U. S. P. 1 : 10 tincture. It is shown that the residual marc of this infusion is quite inactive, and, therefore, completely exhausted. It was found that the drug is completely exhausted in the percolation process of the U. S. P. tincture. Therapeutically, there is nothing to choose between this tincture and the equivalent dose of the infusion prepared as directed. The results obtained are identical. There is no experimental evidence to support the view that a necessary qualitative difference exists between the action of the tincture and the infusion of digitalis, when the latter is prepared properly.—S. Weiss and R. A. Hatcher, *J. Amer. Med. Assoc.*, 1921, 76, 508.

CHINESE PEANUT OIL.—The extraction of Chinese peanut oil from *Arachis hypogæa* is a profitable industry of the province of Kwantung. The peanuts are first washed free of soil and dried in the sun. The nuts are then passed through a large mill, similar to that used for husking rice, and the mixture of whole nuts, husks and kernels are sieved over coarse rattan sieves. The refuse is used for fuel. The husked nuts are now taken to the pressing shed, and are pounded by a very heavy stone pestle in a narrow mortar by hand and foot pressure. The peanut meal is transferred to a shallow wooden tub, which is inverted over a cauldron of boiling water and thoroughly steamed to render the meal more adhesive. The steaming meal is removed in mould form from the tub and is then made into cakes by means of rattan rings, of which ten or so are used to form a cylinder of about 12 inches in diameter. A sufficient number of rings being prepared, the pressing is the next operation. The press consists of a huge hollowed-out tree trunk 18 or 20 feet in length, and about 2 feet in diameter. The trunk is cleaned out except at opposite ends to a diameter of about 12 or 14 inches. A slit along the upper surface of the log allows the contents to be seen. The slit at one end of the log is expanded into a wide open gulley, in which the cakes of meal and some wooden wedges can be inserted. The floor of the trough has a slope, and at the lowest end there is a hole for the drainage of the expressed oil. The press is then filled with the cakes up to the gulley or open portion. Against the outer end of the cakes are placed circular wooden blocks, and behind these are three rows of brick-shaped blocks. Into each row of the latter is forced a wedge by means of a huge wooden mallet. By this means enormous pressure is exerted, and as the brick-shaped blocks slacken, others are put in, until the press is tightly packed. It is then left for twenty-four hours for the oil to trickle out into a large pan under the hole in the trunk. All the oil not being removed by the first pressing, the pressed cake is split into thin plates, which are fried for a few minutes and again submitted to pressure, which yields extra oil. The oil thus expressed is ready for sale, and the residual meal finds a ready market as manure.—Abstracted from the *Hongkonk Weekly Press*, December 4, 1920; through the *Pharm. Journ. and Pharm.*, April, 1921.

TRYPANOCIDAL ACTION OF ARSENIC AND ANTIMONY COMPOUNDS.—Quantitative studies by Carl Voegtlin, Homer W Smith, and others, into the power of certain drugs to sterilize an infected animal are the subject of the recent report to the U. S. Public Health Service. Specifically, the studies were directed to ascertaining the minimum dose, injected intravenously, of certain compounds of arsenic and antimony (important in the treatment of relapsing fever, syphilis, sleeping sickness, etc.), which would prove lethal to the majority of white rats that had been infected with trypanosoma, and also the minimum dose that would prove effective in destroying the parasites.

The minimum effective dose, below which the drug failed to destroy the parasites, was found to be fixed partly by the reaction between the drugs and the parasites, and partly by the rate at which the drug was absorbed by the tissues of the host. Thus, sub-effective doses antimonyl lactate ceased to act, not when they had killed a certain number of parasites, but when absorption by the host had lowered their concentration below their "threshold."

Differences in the effectiveness of different arseno and pentravalent compounds are held to depend on the ease with which they are oxidized or reduced in the body, oxidation or reduction being necessary before they can exert their chief toxic action.

The authors hold that, although the results otained do not indicate with absolute accuracy the clinical value of a compound, they do furnish a valuable quantitative comparison with other compounds.

UTILITY OF ANTIPLAGUE VACCINES.—That the utility of vaccines and serums in antiplague work is at the best not proved is asserted by G. W. McCoy and C. W. Chapin in a recent report of the U. S. Public Health Service. Antiplague vaccine was first used on man in 1897 by Haffkins, who used old killed broth cultures in large doses and claimed that marked reduction in the attacks of the disease resulted. Other observers report much less brilliant results, possibly as later work suggests, because different strains of the plague organism affect the efficiency of the vaccine. Innoculation by living virulent cultures has been found promising by other workers, but its value has not been demonstrated. Vaccination is not known to have ever controlled a plague outbreak.

Evidence in regard to the prophylactic value of serum is meager. Certainly it confers no complete or durable immunity. As a therapeutic agent, however, serum seems to have had some success.

The authors regret that popular and professional interest should so often center on vaccines and serums where anti-rat measures are demanded. If people want to be vaccinated for plague, let them; but the important thing is to kill the rats.

Toxic Effects of Shaking Arsphenamine Solution.—That the shaking of alkalinized aqueous solutions of arsphenamine in the air for 60 or even 30 seconds greatly increases their toxicity, probably by oxidation, is stated by G. B. Roth as a result of experiments described by him in a recent report to the U. S. Public Health Service.

Some preparations, of neoarsphenamine particularly, may be difficulty soluble, and such are liable to be shaken to hasten solution. The results from this are almost always highly toxic and should not be used clinically; although a relatively low-grade preparation may tolerate 5 or 10 seconds of shaking and yet pass the Hygiene Laboratory tests. Shaking in a closed bottle containing no air seems not to increase the toxicity.

The author concludes that the toxicity of the solutions is greatly influenced by the manner of their preparation, and that they should not be made in an open mortar or a large beaker.

Fractionation of Chaulmoogra Oil.—An article by A. L. Dean and Richard Wrenshall, just reprinted by the U. S. Public Health Service from the *Journal of the American Chemical Society,* describes experiments made at the University of Hawaii into the fractionation of chaulmoogra oil. The hope was to find a fraction that contained the curative principle without including the one that renders the whole oil intolerant to many patients.

Four lines of experimental study were followed: (1) Separation of the fatty acids by crystallization from alcohol was tried and abandoned because the fractions gave low melting solids and oily mother liquids. (2) Separation by means of barium acetate was abandoned as unsuitable to production on a large scale. (3) Frac-

tional distillation of ethyl esters under high pressure, though considered promising, was abandoned in favor of (4) direct fractional distillation.

By the last method four esters of the fatty acids of the oil were developed and were used on four groups of patients, a considerable number of whom become clinically and bacteriologically free from leprosy. But it was impossible to identify this effect with anyone of the esters.

DETERMINATION OF LACTOSE IN MILK BY COLORIMETRIC METHOD.—The method is a simple adaption of Folin's latest blood sugar determination to the estimation of lactose.

Method: To 1 c. c. of milk in a 100 c. c. flask add 2 c. c. of 10 per cent. sodium tungstate solution and 2 c. c. two-thirds normal sulphuric acid, the latter drop by drop. Mix and let stand five minutes; dilute to 100 c. c. and filter. Place 1 c. c. of filtrate and 1 c. c. of water in a Folin sugar tube; to the second sugar tube add 2 c. c. of standard lactose solution A. And to a third tube add 2 c. c. of standard lactose solution B. To each of the three tubes add 2 c. c. of alkaline copper solution and boil for six minutes. Cool in water, add 2 c. c. of Folin molybdate phosphate solution and let stand a few minutes. Standard *A* contains 0.5 mg. lactose per 2 c. c. Standard *B* contains 0.7 mg. per 2 c. c. The reading of the standard divided by reading of unknown, multiplied by 5 if Standard I is used, or 7 if Standard II is used gives the grams of lactose per 100 c. c. of milk.

To make the Standard lactose solution make an accurate 1 per cent. lactose solution in distilled water. Preserve with toluol. For Standard I dilute 12.5 c. c. of the stock solution to 500 c. c. For Standard II dilute 17.5 c. c. of stock solution to 500 c. c.—R. G. Owen and Roth Gregg, *J. Lab. & Clin. Med.*, Jan., 1921.

MEDICAL AND PHARMACEUTICAL NOTES

TOXIC IDIOPATHY.—In a lecture at the Royal Institution on March 11, Dr. John Freeman, St. Mary's Hospital, London, gave a most interesting account of the results of recent research on the idiosyncrasy of the human subject with reference to various animal and and vegetable substances introduced into or generated in the living body as food, or in other forms. As an illustration of popular belief in such idiosyncrasy he quoted a specimen of ballroom "conversation" from *Punch* of the 'sixties of the last century: "He: 'D'ye know, my grandfather couldn't bear to have a cat in the room.' She: 'Really! How strange! and my Aunt Dorothy always fainted when she smelled a rose.'" This popular notion, which hitherto had been generally pooh-poohed as a superstition, had now been verified by scientific investigation. It had been ascertained that, in addition to the well-known case of hay-fever sensitive, upon whom grass pollen, and particularly Timothy grass pollen, which in this country was more abundant and widely dispersed than that of any other species, set up the inflammatory conditions of the mucous membrane, and in severe cases the constitutional disturbance characteristic of the malady, many other plant and animal substances had a selective action upon certain individuals, and it was also proved that this idiosyncrasy ran in families. Thus, there were cat-sensitives, who were made ill or contracted asthma by breathing in fragments of a cat's hairs or its shed skin scales, or dust from its secretions; and there were also horse-sensitives, who suffered similarly, even by indirect contact with horses, or by eating horseflesh. In one instance cited by the lecturer, a little girl ate some sausages purporting to be made of ox-beef, but she swooned after taking the sausages, and on subsequent inquiry it was found that horseflesh had been used in their composition. A large number of cases were described of intolerance of certain foods. Thus, one man's poison was carrots; another's cabbage; and so on, and the explanation of the incompatibility of cows' milk with some babies was to be found in idiosyncrasy. If another animal's milk were used, or the cows' milk were denatured, a eupeptic condition could be established. In all these cases it was possible to apply a simple diagnostic test which discriminated between feigned and gen-

uine idiosyncrasy. In hay-fever the conjunctiva becomes bloodshot, and the introduction in some form of the suspected substance into the eye always produces this bloodshot effect. But as it is seldom convenient to apply this test, the urticaria effect is more generally used. This consists in the application to the skin of the arm, from which, by slight scratching, the epidermis has been partially removed, of the suspected substance, or of its precipitated proteids. If there is a reaction in the form of an urticarial eruption, the person is sensitive to the substance, which is therefore contra-indicated as an article of diet, or as a pathogenic vegetable, or animal substance. The lecturer quoted a number of cases from his own hospital and private practice, in which bronchial-asthma in cat and other sensitives had been cured by the elimination of the peccant organic substance. He confessed that the mechanism of these phenomena was still unexplained, but was hopeful that future research would reveal the rationale of it. A few weeks before his death, Lord Moulton, to whom the lecturer had described some of his work on toxic idiopathy, had exclaimed, "At last Nature has come out into the open and we shall catch her."—From the *Pharmaceutical Journal,* March, 1921.

QUININE ACETOSALICYLSULPHATE.—The solubility of quinine sulphate in water at ordinary temperature is usually stated as about 1 part in 800, and that of acetyl-salicylic acid as 1 in 400 of water. On adding the two compounds to water, in ordinary dosage quantities and stirring, it is obvious that the mixture is much more soluble than either of the constituents. It was fairly certain that an acid salt is formed, and it seemed worth while to determine which proportion of acid gave the maximum solubility. By adding the acid in increased molecular proportions, it was found that the best result was obtained by 4 molecules of acetylsalicylic acid to 1 of quinine sulphate. That a definite compound is formed is evident from the behaviour of solutions on evaporating, no appearance of separate constituents being visible. Taking B as representing $C_{20}H_{24}N_2O_2$, we may give the formula of the salt as:

$$B_2.H_2SO_4.4C_9H_8O_4.4H_2O.$$

It is quite usual to give the formula of a salt with the maximum water of hydration which it is capable of taking up. In the case of the salt in question that seems to be 9 molecules, but it readily dries or effloresces to the proportion of 4 molecules, so that the formula

given is probably the more convenient expression. The salt is soluble in water to the extent of 1 part in 50. After drying in desiccator for some hours the salt melts at 96°, much below the m.p. of either of its constituents.—D. B. DOTT, *Pharm. Journal and Pharmacist,* March, 1921.

THEOBROMINE AND CAFFEINE; REACTION TO DISTINGUISH.—The difference between the behaviour of theobromine bismuthic iodide and the corresponding compound of caffeine towards the reducing action of hydriodic acid may be used to differentiate these two substances. The test is conveniently performed as follows:—0.05 g. of theobromine or caffeine is shaken with 10 c. c. of water and 0.5 c. c. of freshly prepared potassium bismuthic iodide solution. In each case an orange-coloured precipitate is formed, and 5 drops of a 10 per cent. tincture of iodine (not freshly prepared, so that it may contain a small proportion of hydriodic acid) is added. The colour of the caffeine bismuthic iodide precipitate changes to a bright red, whilst the theobromine precipitate becomes brown in 15 mins., and dark chocolate brown in less than 30 mins., owing to reduction. A dilute solution of hydriodic acid, containing not more than 1 per cent. of hydrogen iodide, may be used instead of the tincture of iodine.—M. MALMY, through *Journ. of the Society of Chemical Industry,* March, 1921.

A NEW COMPOUND OF BARBITURIC ACID.—At a recent meeting of the *Société de therapeutique,* Paris, a new compound of barbituric acid was described by Daniel Bardet (*L'Union pharm.,* Jan., 1921, p. 1). This is diethyl-diallyl-barbiturate of diethylamine, and is a combination of diethyl-barbituric acid (veronal) and diallyl-barbituric acid (dial) with diethylamine. This compound is soluble in water 1 : 3, this solution containing 10 per cent. of veronal and 10 per cent. of dial. Such a concentrated solution is easily injectable subcutaneously or intravenously, and is accordingly very convenient of administration and rapid in its effects. Daniel states that this new compound is non-toxic in ordinary effective doses; its action is on the central nervous system; it can be employed as an anæsthetic in operations not requiring complete muscular relaxation; it is a valuable adjunct to general anæsthesia, suppressing the period of excitation and allowing of the employment of a minimum quantity of anæsthetic; it has the drawback of not always giving the same results in the same

doses; its slow elimination prolongs its hypnotic action too much and tends to mask postoperative effects, and this second drawback serves to contra-indicate its use in large doses and in abdominal operations. Its great advantage is its solubility, and in spite of its drawbacks there are fields for its employment that may bring it into use in medicine and surgery.—*The Prescriber,* April, 1921.

NEWS ITEMS AND PERSONAL NOTES

ESTABLISHMENT OF A FOOD RESEARCH INSTITUTE.—The Carnegie Corporation of New York has entered into an agreement with Leland Stanford, Jr., University, by which a food research institute is to be established at the university for the intensive study of the problems of production, distribution and consumption of food. The corporation expressed hope that the new organization will in time be known as the Hoover Institute. The corporation will provide $700,000 for its support for ten years. Dr. C. L. Alsberg, Chief of the Bureau of Chemistry of the U. S. Department of Agriculture, has been elected the first director.

THE EXAMINATION FOR FAIRCHILD SCHOLARSHIP.—Candidates will be examined in the Schools and Colleges of Pharmacy, members of the American Conference of Pharmaceutical Faculties, June 11, 1921. The Deans of the respective institutions will have supervision over the examinations.

The following recommendation was unanimously adopted at the New York A. Ph. A. meeting by the Section on Education and Legislation A. Ph. A., the American Conference of Pharmaceutical Faculties and the National Association of Boards of Pharmacy, in joint session, and this will serve as the basis for award:

> The Fairchild Scholarship is to be awarded by a competitive examination to candidates who are High School graduates, and who have completed their first year work in a School or College of Pharmacy, member of the American Conference of Pharmaceutical Faculties, and each School or College shall be limited to two candidates.
>
> One award is made each year.

IMMIGRANT HEALTH AND THE COMMUNITY.—The Carnegie Corporation of New York has recently made public the following extract from a forthcoming book on "Immigrant Health and the Community," which is to present the fifth of the Americanization studies made under the auspices of the Corporation:

"The local drug store, the place where most patent medicines are purchased, is an important center of medical advice. There are several reasons for this.

"Usually the local druggist or someone in his employ speaks the immigrant's language, and if there is a large colony of any one mother-tongue group there are certain to be several drug stores where the language is spoken. The drug store is localized and therefore readily becomes known to the immigrant.

"We must appreciate also that the pharmacist is properly regarded by many immigrants as a man of learning. The drug store is anxious to co-operate with the immigrant and the immigrant's local organizations.

"Drug stores are important from the medical standpoint, because it is to them rather than to the doctor that the immigrant first turns. New arrivals and people who have not had occasion to use a doctor since their arrival frequently turn to the druggist for advice about doctors. Local doctors are, therefore, the friends of the druggist, and his store is a meeting place both for social and professional acquaintances who chat, and for business competitors who keep an eye on one another."

BOOK REVIEWS

"LABORATORY MANUAL FOR THE DETECTION OF POISONS AND POWERFUL DRUGS." By DR. WILHELM AUTENRIETH, Professor in the University of Freiburg, i. B. Authorized translation by William H. Warren, Ph. D. Fifth American edition. P. Blakiston's Son & Company, Philadelphia. 342 pages; $3.50 net.

In the preface, the translator states that this "present Englisn edition is a translation of the fourth completely revised German edition, as a fifth German edition, so far as the writer is aware, has not yet appeared."

It is also stated that "owing to the prominence attained of late by wood (methyl) alcohol, due to ignorant or criminally careless

substitution of this intoxicant for grain (ethyl) alcohol, this substance has been added to the list of volatile poisons. Aside from minor corrections of the text, the omission and correction of certain tests, the introduction of a few new tests of recent appearance in the literature, and the expansion of the index to include authors as well as subjects, no changes of importance have been made in the last edition of this work."

Laboratory workers and students in toxicological chemistry will do well to include this book in their "five-foot shelf." Being quite comprehensive, it will be found generally useful, whether for experimental practice or for guidance in isolating and estimating poisons in cadaveric material, food, etc.

The scheme of analysis divides poisons into three groups, which are dealt with in the first three chapters. Group I includes those substances which, when heated, volatilize without decomposition and distil with steam from an acid solution. The members of Group II are non-volatile organic substances, which do not distil with steam from an acid solution, but which may be separated from extraneous matter by extracting with hot alcohol containing tartaric acid. Group III includes all metallic poisons. A few poisons such as mineral acids, caustic alkalies, oxalic acid and potassium chlorate are tested for by separate tests, owing to inherent peculiarities of these substances. Chapter IV embraces this group. Chapter V is devoted to special qualitative and quantitative methods for arsenic, alkaloids and salicylic acid. The quantitative estimation of alkaloids and other active principals in raw materials and preparations according to the German Pharmacopœia, is taken up in Chapter VI. Chapter VII deals with the detection of carbon monoxide blood, blood stains and human blood.

In the appendix are given formulæ for the preparation of general alkaloidal reagents and the other reagents and solutions used.

In short, the treatment of this subject is quite thorough and systematic, with liberal explanatory notes and many references to original articles. The book commends itself to those interested in toxicological and alkaloidal work.

R. R. F.

YEAR-BOOK OF PHARMACY. Published by J. and A. Churchill. London, 1920; 594 pages.

This is an annual British publication containing abstract of papers contributed to scientific journals, together with the transactions of the British Pharmaceutical Conference held in Liverpool in July of 1920.

The first 347 pages of this book are devoted to the abstracts relating to pharmacy, materia medica and chemistry of drugs. These were selected from contributions to scientific journals during the period from July 1, 1919, to June 30, 1920. While the great majority of the abstracts are taken from European periodicals, quite a large number of them are found to be of American origin.

The plan of the book is unique. The abstracts dealing with chemistry are arranged first and these are divided into convenient sub-sections. This is followed by the sections on materia medica and pharmacy, each being divided into sub-groups according to the nature of the abstract.

Then follows an interesting and useful research list covering several pages. It is probable that some of the suggestions found here have already been taken up for investigation.

The remainder of the book contains the transactions of the British Pharmaceutical Conference of 1920. In the scientific section of this part are found many communications and discussions which directly concern the pharmacist and the pharmaceutical chemist. At the close of these transactions is found a list of the members of the conference.

The book is thoroughly indexed and represents, in condensed form, practically all the year's work accomplished in pharmacy and its allied sciences. It certainly merits recommendation to the American as well as the British pharmacist and analyst as an excellent book for reference.

E. J. H.